



## RESEARCH ARTICLE

## Determining the Difference between the Incidence of ANA positivity and its Patterns in Healthy Children and Children Suffering from Rheumatologic disease in the Referrals of Pediatrics Medical Center

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Received: 26 Mar 2015

Revised: 21 Apr 2015

Accepted: 27 May 2015

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**ABSTRACT**

The main purpose of this study is determining the difference between the incidence of ANA positivity and its patterns in healthy children and children suffering from rheumatologic diseases such as: SLE, JRA, etc in a tertiary pediatric center from 2013 to 2014. In this study we compared 100 healthy and 100 patient children by indirect Immunofluorescence antibody determining method. Then the positivity of ANA and its patterns - if positive - compared between healthy and patient children suffering from various rheumatologic diseases. From 100 patient children 3 had SLE and ANA was positive in 2 of them. 51 of the children had JRA that 35 had positive ANA results. There were 46 children suffering from other rheumatologic diseases and ANA was positive in 34 of them. Among 100 healthy children 34 of them had positive ANA test. The difference between ANA positivity and its patterns in children suffering from SLE, JRA and other rheumatologic diseases and healthy children was meaningful. The difference between incidence of ANA positivity in different ages was meaningful. The incidence of ANA positivity was 73.7 % in boys and 67.44% in girls. The difference between the incidence of ANA positivity and its patterns in patient children and healthy ones was meaningful – as presumed earlier.

**Keywords:** Antinuclear Antibody, healthy children, rheumatologic disease, SLE, JRA.

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## INTRODUCTION

Pediatric rheumatologic diseases are rare diseases, which subsequently leads to morbidity which affects the quality of life of children and their families in addition to the cost [1]. The ANA test is a test that mostly is used in children and often can be requested as screening tests for rheumatologic diseases. As sensitivity and specificity is low for the most musculoskeletal and rheumatologic diseases in children, screening tests should be requested for non-specific complaints such as musculoskeletal pain and should be used as a diagnostic test for children at risk of SLE disease or MCTD (Mixed Connective Tissue Disease)[2,3]. SLE is an autoimmune disease characterized by the production of large amounts of auto-antibodies. ANA Detection is common in these patients and the antibodies are positive in 95% of patients. Rheumatic diseases are identified with one or more auto-antibodies against surface components and the cytoplasm, nucleus, or core envelope [4,5]. Antibodies against nuclear antigens (ANA) are the hallmark of systemic rheumatic diseases [6]. Most laboratories in the world use ANA-IFA with HEP-2 Cell Substrate as Gold Standard for ANA Detection of systemic rheumatic disease. These antibodies directed against the components of the cell's nucleus and cytoplasm [7,8].

ANA ELISA is used to test the sensitivity and specificity for the detection, so we used it as initial ANA Screening, but the samples that were positive in the ELISA, should be tested in HEP-2 cells to determine their immunofluorescent pattern. Currently the IFA test is a Gold Standard test for the detection of ANA in clinical practice. Also the false-positive ELISA test is high in healthy subjects [9,10].

ANA positivity in children can be seen in the following cases:

- SLE
- Juvenile Idiopathic Arthritis
- Juvenile Dermatomyositis
- Scleroderma (Systemic and local)
- Mixed Connective Tissue Disease[3,11,12]

ANA also can be positive in the absence of autoimmune diseases, along with infections, some medications, neoplasia, pregnancy and also in normal subjects, especially in old age [13,15]. ANA positivity in healthy people usually happens due to unimportant factors, but such people are at increased risk of developing autoimmune diseases. In a study, association of microalbuminuria and cardiovascular morbidity ANA has been shown. Since the number of studies is few for children, and no Iranian study has been done in this regard, we decided to analyze the frequency of positive ANA test and indirect immunofluorescence staining pattern in healthy children compared to children with rheumatologic diseases [18].

## METHODOLOGY

In this cross-sectional study, children with rheumatologic diseases (SLE, JRA and other rheumatologic diseases) at age 0-15years referring Children's Medical Center hospital during the years of 2013-2014 have been included and the frequency of ANA positivity, serum titers as well as their IF patterns were studied. Rheumatologic diseases are a range of diseases related to the involvement of bones and joints including arthritis and autoimmune diseases as well as vasculitis. Diagnosis based on clinical signs of rheumatologic diseases in children and related criteria of rheumatologic disease considering laboratory data is done by pediatric rheumatologists of Children's Medical Center hospital. Measuring ANA by IFA (FANA) method was carried out on serum samples in two groups of patients and controls. To perform the test, blood samples of patients and healthy children have been taken and serum was separated after centrifugation. Samples can be maintained at a temperature of 2-8 ° C for 2 days and at -20 ° C for a long time. Contaminated and lipemic samples are not used. In this method, antibody of diluted samples of patients and healthy children react if existed with HEP-2 Cell antigen immobilized on slide, and then after incubation and washing, Anti-Human IgG conjugated to (FITC) Fluorescent-Isothiocyanate is added to the slides. Finally, after incubation and washing, slides have been viewed using fluorescence microscopy. Slides were analyzed on the same



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they prepared. According to the histological alignment of antigens in HEP-2 Cell, a specific fluorescent staining can be detected. Fluorescence intensity is measured as quantitative. Individual serum titer in a positive sample is the serum titer of last tube in serial serum dilution in which the fluorescence can be detected. The serum titer of  $\geq 1.80$  is considered as positive. According to the stained nucleus and cytoplasm of HEP-2 cells several patterns have been described.

**The study population**

Children with rheumatologic diseases (SLE, JRA, and other rheumatologic diseases) at age 0-15 years referring to Children's Medical Center hospital during the year of 1393-1392 were selected. The study was designed in a list, and then analyzed the data using SPSS software version 19.

**RESULTS AND DISCUSSION**

Rheumatologic diseases in children are rare diseases that caused the subsequent morbidity which affect the quality of life of the child and his family, in addition it includes the cost [1]. ANA test is often requested as screening tests for rheumatologic diseases [2]. ANA is hallmark of systemic rheumatologic diseases [6] and is the base of diagnosis and treatment of childhood rheumatologic diseases such as SLE, JIA, Systemic sclerosis, PAN and so on. Positive ANA in healthy people is more often not important, but such people are at increased risk of developing autoimmune diseases [17]. In our study, 3 children of 100 pediatric patients who were referred to the Rheumatology Clinic of Children's Medical Center hospital, suffered from SLE of which two children had a positive ANA test. 51 children had JRA, of which 35 had positive ANA test. Children with other rheumatologic diseases (including Henoch-Schönlein purpura, polymyositis, dermatomyositis, and scleroderma) were 46 cases of which 34 children had a positive ANA test. In our study, 34 children had a positive ANA test among 100 healthy children who were referred to Children's Medical Center hospital for routine check up.

In a study conducted in Turkey in 2014 by Zafer Mengelglu, ANA was positive in patients with SLE and RA and positive ANA test in healthy subjects has been reported in 5% of population [20]. In a study conducted in Thailand in 2005, the prevalence of ANA in healthy children was studied. In this study, the ANA in 15% of healthy children with dilution of 1:40 and 3% dilution of 1: 80 was positive, while 34% of healthy children in our study had a positive ANA test. In a study in 2000 in America by B.C. Perilloux and colleagues, most patients with autoimmune diseases had a positive ANA test [14]. The most common diagnosis was JRA that was the most common diagnosis in our study. In our study, it was shown that the frequency of ANA positivity in children with JRA, SLE and healthy children and children with other rheumatologic diseases are different ( $P = 0.000$ ) [2].

In our study, the most common patterns in children with SLE were fine speckled and homogeneous. But we had only 3 patients with SLE, which can be concluded that with these few patients we cannot conclude correctly. It is necessary to have a greater number of patients to have more accurate assessments of various ANA patterns. Among children with JRA, the most common pattern in children with other rheumatologic diseases is homogeneous and the most common pattern in healthy children was fine speckled. In a study conducted in Turkey in 2014, the most common pattern of ANA was speckled. In a study conducted in Thailand in 2005, the most common pattern of ANA was homogeneous. In our study, it was shown that the frequency of ANA patterns in children with JRA, SLE and children with other rheumatologic diseases and healthy children is different ( $P = 0.000$ ). In our study about pediatric patients, the frequency of positive ANA test was higher in the range of 60 to 120 months of age and the frequency of positive ANA test showed no significant difference in ages ( $P = 0.001$ ). In the control group, positive ANA test frequency in range 0-60 months was higher and frequency of positive ANA was significant in different ages ( $P = 0.049$ ). Following healthy individuals positive ANA, frequency of ANA positivity and risk of autoimmune diseases increases as mentioned in previous studies. In a study that was conducted in 2012 in America ANA prevalence





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increased with age[1]. In a study performed in 2011 in America, age was not significantly associated with the ANA [17]. In a study in 2000 in America, the most common age range for people who had a positive ANA test was between 3 months to 18 years [2]. In our study, there were 57 girls and 43 boys in the group of patients that the frequency of positive ANA in the patient group was 73.7% for girls and 67.4% for boys. In our study, the frequency of positive ANA in two genders had no significant difference ( $P = 0.496$ ). The frequency of positive ANA in healthy children showed no difference between males and females ( $P = 0.683$ ).

In 2014 in Turkey and in 2012 and 2011 in America, ANA positivity rate was higher in women than men that were different with our study and this could be due to differences in our study population because most previous studies were done on adults [20,11]. In a study conducted in 2000 in America, the prevalence of positive ANA test was more in girls In our study, the most common type in pediatric patients suffering from rheumatologic diseases was fine speckled 0- 60 month (which was the most common age range) [2]. The most common model in the age range of 60 to 120 months was homogeneous and the most common model in the age range of 120 to 180 months was also fine speckled. In our study, it was shown that the frequency of ANA patterns is different in age groups ( $P = 0/002$ ). In healthy children of different ages speckled pattern was most common. In the control group, there was no significant difference between the frequency of ANA patterns in different age groups ( $P = 0.729$ ). In our study, the most common ANA pattern of girls was homogeneous and for boys was speckled in the patient group and the frequency of different patterns of ANA in two genders had no significant difference ( $P = 0.089$ ). Speckled pattern was more common in boys and girls in healthy group and frequency of different ANA patterns in both genders had no significant difference ( $P = 0.405$ )

The results of our study and previous studies shows that there are differences that may be due to the number of patients and with the increase in the number of patients in each group, the differences are corrected or perhaps it is because of some environmental influences or Iranian children genetic. According to information obtained, it was concluded that the frequency of positive ANA and its different patterns between healthy children and children with JRA, SLE and other rheumatologic diseases is different. Since rheumatologic diseases are chronic diseases of children, its influence in child's life can be large and its rapid and accurate diagnosis is important because treatment can reduce morbidity and mortality. Executive limitations of the plan and their reduction method Lack of parental cooperation is part of the executive restrictions. We tried to explain about tests and the results to get parental consent. In collecting healthy samples as parents may not have given the exact history of recent infection and the drug correctly, we were therefore likely to have problems and with an emphasis on the impact of these conditions on the test results, we decreased the problem. It's better to have larger population study with a larger number of patients and the healthy people to ensure better and more accurate results, it is suggested to increase the number of patients in each subgroup to better evaluation of different ANA patterns in a particular disease. It is also better to follow positive ANA healthy people, especially those who are entitled to determine the status of rheumatologic diseases in the years later.

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**Table 1: The frequency of positive ANA in children**

| ANA              | Positive ANA |                         | Negative ANA |                         | Total     |                         |
|------------------|--------------|-------------------------|--------------|-------------------------|-----------|-------------------------|
|                  | Frequency    | Percentage of frequency | Frequency    | Percentage of frequency | Frequency | Percentage of frequency |
| <b>Diagnosis</b> |              |                         |              |                         |           |                         |
| SLE              | 2            | 66.67%                  | 1            | 33.33%                  | 3         | 1.5%                    |
| JRA              | 35           | 68.63%                  | 16           | 31.37%                  | 51        | 25.5%                   |
| Other            | 34           | 73.91%                  | 12           | 26.08%                  | 46        | 23%                     |
| Control          | 34           | 34%                     | 66           | 66%                     | 100       | 50%                     |
| Total            | 105          | 100%                    | 95           | 100%                    | 200       | 100%                    |

According to Table 1, positive ANA has the most frequency in other rheumatologic diseases and the lowest frequency in patients with SLE. The frequency of ANA positivity is significantly different in children with SLE and healthy children.

**Table 2: Frequency of positive ANA in SLE and healthy groups**

| Variable diagnosis | SLE       |            | Control   |            |
|--------------------|-----------|------------|-----------|------------|
|                    | Frequency | Percentage | Frequency | Percentage |
| Positive ANA       | 2         | 66.67%     | 34        | 34%        |

**Table 3: frequency of positive ANA in two groups of patients with JRA and the healthy group**

| Variable diagnosis | JRA       |            | Control   |            |
|--------------------|-----------|------------|-----------|------------|
|                    | Frequency | Percentage | Frequency | Percentage |
| Positive ANA       | 35        | 68.63%     | 34        | 34%        |

According to Table 3, the frequency of ANA positivity in SLE and healthy children has a significant difference. Also, the frequency of ANA positivity in children with JRA and healthy children was also different.

**Table 4: Positive frequency of ANA in two groups of rheumatologic patients and healthy group**

| Variable diagnosis | Other     |            | Control   |            |
|--------------------|-----------|------------|-----------|------------|
|                    | Frequency | Percentage | Frequency | Percentage |
| Positive ANA       | 34        | 73.91%     | 34        | 34%        |

According to Table 4, there is a significant difference in the frequency of ANA positivity between the children with other rheumatologic problems and healthy children.





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**Table 5: The frequency of different ANA patterns in children**

| Variable diagnosis    | SLE |       | JRA |        | Others |        | Total |      | Control |      |
|-----------------------|-----|-------|-----|--------|--------|--------|-------|------|---------|------|
|                       | F   | F%    | F   | F%     | F      | F%     | F     | F%   | F       | F%   |
| Speckled              | 1   | 33.3% | 16  | 3.371% | 22     | 4.827% | 39    | %39  | 24      | %24  |
| perinuclear           | 0   | 0%    | 1   | 1.96%  | 0      | 0%     | 1     | %1   | 0       | %0   |
| homogeneous           | 1   | 33.3% | 18  | 3.295% | 8      | 1.397% | 27    | %27  | 10      | %10  |
| nucleolar             | 0   | 0%    | 0   | 0%     | 3      | 6.52%  | 3     | %3   | 2       | %2   |
| homogeneous nucleolar | 0   | 0%    | 0   | 0%     | 1      | 2.17%  | 1     | %1   | 2       | %2   |
| neg                   | 1   | 33.3% | 16  | 3.371% | 12     | 2.086% | 29    | %29  | 62      | %62  |
| Total                 | 3   | 100%  | 51  | 100%   | 46     | 100%   | 100   | %100 | 100     | %100 |

**Table 6: The frequency of different ANA patterns in both SLE and healthy groups**

| Variable diagnosis    | SLE       |            | Control   |            |
|-----------------------|-----------|------------|-----------|------------|
|                       | Frequency | Percentage | Frequency | Percentage |
| Speckled              | 1         | 33.3%      | 24        | 24%        |
| Perinuclear           | 0         | 0%         | 0         | 0%         |
| Homogeneous           | 1         | 33.3%      | 10        | 10%        |
| Nucleolar             | 0         | 0%         | 2         | 2%         |
| homogeneous nucleolar | 0         | 0%         | 2         | 2%         |
| Neg                   | 1         | 33.3%      | 62        | 62%        |
| Total                 | 3         | 100%       | 100       | 100%       |

According to Table 6, the frequency of different ANA patterns in children with SLE and healthy children is different.

**Table 7: Different patterns in the two groups of patients with JRA and healthy ANA**

| Variable diagnosis | JRA       |            | Control   |            |
|--------------------|-----------|------------|-----------|------------|
|                    | Frequency | Percentage | Frequency | Percentage |
| Speckled           | 16        | 31.37%     | 24        | 24%        |
| Perinuclear        | 1         | 1.96%      | 0         | 0%         |
| Homogeneous        | 18        | 35.29%     | 10        | 10%        |
| Nucleolar          | 0         | 0%         | 2         | 2%         |
| homogeneous        | 0         | 0%         | 2         | 2%         |





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|           |    |        |     |      |
|-----------|----|--------|-----|------|
| nucleolar |    |        |     |      |
| Neg       | 16 | 31.37% | 62  | 62%  |
| Total     | 51 | 100%   | 100 | 100% |

According to Table 7, the frequency of different ANA patterns is different in children with JRA and healthy children.

**Table 8: The frequency of different ANA patterns in two groups of children with other rheumatologic diseases and the healthy group**

| Variable diagnosis    | Others    |            | Control   |            |
|-----------------------|-----------|------------|-----------|------------|
|                       | Frequency | Percentage | Frequency | Percentage |
| Speckled              | 22        | 47.82%     | 24        | 24%        |
| Perinuclear           | 0         | 0%         | 0         | 0%         |
| Homogeneous           | 8         | 17.39%     | 10        | 10%        |
| Nucleolar             | 3         | 6.52%      | 2         | 2%         |
| homogeneous nucleolar | 1         | 2.17%      | 2         | 2%         |
| Neg                   | 12        | 26.08%     | 62        | 62%        |
| Total                 | 46        | 100%       | 100       | 100%       |

The frequency of different ANA patterns also indicates a significant difference in children with other rheumatologic diseases and healthy children. (Table 8).

**Table 9: The frequency of ANA positivity regarding the age groups**

| Age groups | Experimental |            | Control   |            | Total     |            |
|------------|--------------|------------|-----------|------------|-----------|------------|
|            | Frequency    | Percentage | Frequency | Percentage | Frequency | Percentage |
| 0-60       | 23           | 32.39%     | 16        | 47%        | 39        | 37.14%     |
| 60-120     | 33           | 46.48%     | 14        | 41.17%     | 47        | 44.76%     |
| 120-180    | 15           | 21.13%     | 4         | 11.76%     | 30        | 28.57%     |
| Total      | 71           | 100%       | 34        | 100%       | 105       | 100%       |

According to Table 9, the frequency of ANA positivity is different in various age groups. According to this table, the highest frequency of ANA positivity in children is in the age range of 60 to 120 months and the highest frequency of ANA positivity is in healthy children in the age range is 0-60 month. According to Table 4-16, the frequency of ANA positivity in different age groups is different in the patient group (P-Value = 0.049) and in the control group (P-Value = 0.001). The frequency of ANA positivity varies regarding the gender.







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**Table 10: the frequency of ANA positivity regarding gender**

| Gender groups | Patient   |            | Control     |             | total     |            |
|---------------|-----------|------------|-------------|-------------|-----------|------------|
|               | Frequency | Percentage | Freq uenc y | Percen tage | Frequency | Percentage |
| Girl (female) | 42        | 73.7%      | 14          | 31.8%       | 56        | 53.33%     |
| Boy (male)    | 29        | 67.4%      | 20          | 35.7%       | 49        | 46.66%     |

According to the table above, 73.7% of female patients and 67.4% of male patients have a positive ANA, and 31.8% of healthy girls and 35.7% of healthy boys have positive ANA. According to Table 10, the frequency of ANA positivity is not different between girls and boys in the patient group (P-Value = 0.496) and in the control group (P-Value = 0.683).

**Table 11: Frequency of different ANA patterns in different age groups**

| Group         | Antibody age range     | 0-60 |        | 60-120 |        | 120-180 |        | Total |      |
|---------------|------------------------|------|--------|--------|--------|---------|--------|-------|------|
|               |                        | F    | F%     | F      | F%     | F       | F%     | F     | F%   |
| Experim ental | Speckled               | 12   | 27.27% | 15     | 38.46% | 12      | 70.58% | 39    | 39%  |
|               | perinuclear            | 1    | 2.27%  | 0      | 0%     | 0       | 0%     | 1     | 1%   |
|               | homogeneo us           | 9    | 20.45% | 16     | 41.02% | 2       | 11.76% | 27    | 1%   |
|               | nucleolar              | 1    | 2.27%  | 2      | 5.12%  | 0       | 0%     | 3     | 3%   |
|               | homogeneo us nucleolar | 0    | 0%     | 0      | 0%     | 1       | 5.88%  | 1     | 1%   |
|               | Neg                    | 21   | 47.72% | 6      | 15.38% | 2       | 11.76% | 29    | 29%  |
|               | Total                  | 44   | 100%   | 39     | %100   | 17      | 100%   | 100   | 100% |
| Control       | Speckled               | 14   | 24.13% | 9      | 24.32% | 1       | 20%    | 24    | 24%  |
|               | perinuclear            | 0    | 0%     | 0      | 0%     | 0       | 0%     | 0     | 0%   |
|               | homogeneo us           | 3    | 5.17%  | 6      | 16.21% | 1       | 20%    | 10    | 10%  |
|               | nucleolar              | 1    | 1.72%  | 1      | 2.70%  | 0       | 0%     | 2     | 2%   |
|               | homogeneo us nucleolar | 2    | 3.44%  | 0      | %0     | 0       | 0%     | 2     | 2%   |
|               | Neg                    | 38   | 65.51% | 21     | 75.56% | 3       | 60%    | 62    | 62%  |
|               | Total                  | 58   | 100%   | 37     | %100   | 5       | 100%   | 100   | 100% |

According to Table 11, the frequency of different ANA patterns in various age groups is different, but there is no statistically significant difference between the frequency of ANA patterns in different age groups in healthy children.





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**Table 12: Frequency of different ANA patterns regarding gender**

| Group               | Antibody age range    | Girl (female) |       | Boy (male) |       | Total |      |
|---------------------|-----------------------|---------------|-------|------------|-------|-------|------|
|                     | Antibody nuclear      | F             | F%    | F          | F%    | F     | F%   |
| <b>Experimental</b> | Speckled              | 19            | 33.3% | 20         | 46.5% | 39    | 39%  |
|                     | perinuclear           | 0             | 0%    | 1          | 2.3%  | 1     | 1%   |
|                     | homogeneous           | 20            | 35.1% | 7          | 16.3% | 27    | 27%  |
|                     | nucleolar             | 3             | 5.3%  | 0          | 0%    | 3     | 3%   |
|                     | homogeneous nucleolar | 0             | 0%    | 1          | 2.3%  | 1     | 1%   |
|                     | Neg                   | 15            | 26.3% | 14         | 32.5% | 29    | 29%  |
|                     | Total                 | 57            | 100%  | 43         | 100%  | 100   | 100% |
| <b>Control</b>      | Speckled              | 10            | 22.7% | 14         | 25%   | 24    | 24%  |
|                     | perinuclear           | 0             | 0%    | 0          | 0%    | 0     | 0%   |
|                     | homogeneous           | 6             | 13.6% | 4          | 7.1%  | 10    | 10%  |
|                     | nucleolar             | 1             | 2.3%  | 1          | 1.8%  | 2     | 2%   |
|                     | homogeneous nucleolar | 2             | 4.5%  | 0          | 0%    | 2     | 2%   |
|                     | Neg                   | 25            | 56.8% | 37         | 66.1% | 62    | 62%  |
|                     | Total                 | 44            | 100%  | 56         | 100%  | 100   | 100% |

Table shows the frequency of different ANA patterns in both genders of patients and control groups. Frequency of different ANA patterns in different sexes did not differ between these two groups.





## RESEARCH ARTICLE

## Urinary Level of Heparin-Binding Protein in Pediatric Urinary Tract Infection

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Received: 20 Mar 2015

Revised: 21 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

Urinary tract infection is the third widespread pediatric bacterial infection after involvement of respiratory & auditory systems by microorganisms. Delayed treatment will lead to renal complications & on the other hand, unnecessary anti-microbial treatments will cause drug resistant germs. Appropriate diagnostic tests are account for true primary management & decision making by the doctors. The heparin-binding protein, which releases from secretory vesicles & azurophilic granules of activated neutrophils, were been expressed as a diagnostic biomarker for bacterial infections on different studies. Comparison of heparin-binding protein level in urine of children with & without urinary tract infection is the aim of our study. Thirty-five children with Confirmed UTI by urine culture & twenty-five apparently healthy children without UTI features, which referred to a tertiary pediatric center (between October 2013 to May 2014) have been included. The children did not receive any medications from 72 hours before their admission. Urine samples were cultured & analyzed by dipstick (from leukocyte esterase & nitrite point of view). For assessment of urinary HBP levels, samples were been centrifuged for one hour after being cultured & then their supernatant aliquot were kept at -70 °C after they had analyzed. Enzyme-linked immune sorbent assay technique have used for HBP level assessment. There was significant difference in urinary HBP levels between control & cases. As well, there were significant relations between urinary HBP levels with type of bacteria (gram negative or positive), WBC count, presence of leukocyte esterase & nitrite. But there were no significant relation between different sexes & ages. Urinary



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HBP levels over 10 ng / ml were supposed as a diagnostic cut off for UTI confirmation in this study. Our results showed that urinary HBP can be helpful for assessment of children suspicious of UTI as a diagnostic test.

**Key words:** Heparin-binding protein, Children, Urinary tract infection

## INTRODUCTION

Urinary tract infection is the third most common bacterial infection in children after otitis and respiratory tract infection. (1) Accurate diagnosis depends on appropriate sampling. The urine culture as "Gold Standard" is used to diagnosis of urinary tract infection but the dipstick rapid test is commonly used for the initial diagnosis. Dipstick usually suggests the presence of nitrite, leukocyte esterase and leukocytes in urinary tract infection diagnosis (2-3). Nitrite highly characterizes urinary tract infection but it has less sensitivity in the diagnosis. False negative results are created by the infection with bacteria that do not produce nitrite (Streptococcus Group B and Staphylococcus saprophyticus) or when low concentration of bacteria exists in samples. WBCs also have a little role in the diagnosis of urinary tract infections. IL-6 which is secreted by the epithelial cells of the urinary tract rises significantly in the urine of patients with urinary tract infection. (4) Neutrophils are important effectors in the host that have materials with different biological capabilities in their granules (5). HBP protein (CAP 37 Or Azurocidin Glycoprotein I with 251 amino acid as the precursor and 26 amino acids at the end -N Terminal 3 amino acids in -C Terminal. (6-8) and its activities are heavily dependent on PH as in lower pH it has activity against both Gram-positive bacteria and Candida albicans(6).

HBP acts as a Chemoattractant and activates macrophages and monocytes and therefore its functional result is the release of cytokines and bacterial phagocytosis. HBP also acts as a T cell activator. The activation of leukocytes is performed by integrin  $\beta 2$  and the chemotaxis is due to HBP related to Formyl-Peptid receptors. In addition Azurocidine activate vascular endothelial cells and the formation of edema and vascular leakage (7). HBP is now being used as a biomarker for diagnosis of severe sepsis, Septic shock (9), Bacterial meningitis (10) and Erysipelas. A study was conducted in 2012 by Charlott Kjolvmarm et al. and analyzed the urinary level in 78 children (26 boys, 52 girls at the age of 1-18 months). All patients with high urine culture growth of bacteria (more than  $10^5$ ) had high level of HBP. All patients with confirmed UTI had high HBP level (more than 32 ng / ml). The level of HBP in patients with UTI is higher than other types of infections and this represents the release of HBP induced by the activation of the WBCs following bacterial infection (12).

Several studies have been performed on the role of HBP as an early marker of sepsis along with circulatory failure, increase level of HBP in the CSF of patients with bacterial meningitis and its increase in skin biopsies of patients with Erysipelas. Another study in 2009 by Adam Linder et al. was performed on the role of HBP as an early marker of sepsis of circulatory failure. (12) In another study it was found that infection with group A streptococcus causes activation of neutrophils and release of HBP in skin infections. (11) In another study, it can be said that the urinary HBP is an appropriate diagnostic marker for the diagnosis of a UTI and differentiating pyelonephritis from cystitis and it can be used as a diagnostic marker in patients with suspected UTI (13). Due to high levels of sensitivity and Urinary HBP trait in diagnosis of UTI in this study and its lack of implementation in Iran we have attempted to determine the level of HBP in children with urinary tract infection and healthy children.

## METHODOLOGY

In this study 35 children with culture-proven urinary tract infection and 25 healthy children with no symptoms suggestive of urinary tract infection referring to Childrens' Medical Center hospital in the years 2013-2014 were studied. The urinary samples of all children were cultured and analyzed by dipstick (to check leukocyte esterase and nitrite). To assess the level of HBP the samples after culture and dipstick were centrifuged for 1 hour and then Aliquot of supernatant was held at -70 ° C until analysis.



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The analysis of the level of HBP was performed by Enzyme-Linked Immunosorbent Assay on samples with positive urine culture. These children should have a body temperature  $\geq 37.5$  ° C or symptoms suggestive of urinary tract infections such as dysuria, abdominal or flank pain in older children and irritability and poor feeding in younger children (urinary tract infection is proven by culture) and did not receive antibiotics during the last 72 hours. The control group of the study was selected among the preschool children, who are apparently healthy and have no symptoms suggestive of urinary tract infection, children who referred to the center for routine vaccination or check up and with negative urine cultures. The main independent variable in this study is urinary tract infection (the existence of  $10^5$  isolated pathogens in urine culture or  $10^4$  colonies with symptomatic children means urinary tract infection).

Data are collected for anyone separately in the form of the questionnaire. All the required information was collected on the form. In this study Midstream urine sample was taken from patients and then cultured and dipstick was performed so that the samples would be kept at  $70$  ° C and then the HBP was measured by ELISA. The informed consent was obtained from the patients participating in the study (the parents). Parents of patients were fully aware of the study. This study was transferred to the ethics committee of the university to receive the approval.

To analyze the data, SPSS 19.0 software was used,  $0.05 > P$ -value was considered statistically significant

**RESULTS**

In this study, 35 patients were evaluated in the case group and 25 patient participated in the control group, among which 32 patients were female (53.3%) and 28 ones were male (46.7%). The patients and control subjects were analyzed in three age groups of less than one year, one to five years and more than 5 years old. In the patient group 9 subjects were below 1 year old, 16 were aged 1-5 and 15 were above 5. In the control group 10 subjects were below 1 year old, 11 were aged 1-5 and 4 were above 5. The mean age of the patient group is  $3 \pm 2.95$  and the mean age of the control group is  $2.7 \pm 4.39$ . HBP urinary level in the two groups showed significant differences in such a way that a urinary level of HBP in the case group was significantly higher than the control group (Table 1).

**CONCLUSION**

Urinary tract infection is the third most common bacterial infection in children after ear and respiratory system infection. In a recent survey, the prevalence of urinary tract infections with fever in infants is 7% and in older children is 8.7%. Early diagnosis and UTI treatment to prevent long-term kidney complications is necessary. HBP acts as a Chemoattractant and activates macrophages and monocytes and its functional performance includes the increase in the release of cytokines and bacterial phagocytosis. In a recent study the urinary HBP level in children with UTI was analyzed to evaluate the diagnostic ability of this protein compared to urine culture, dipstick and IL-6 level. The results showed that HBP is a biomarker for the diagnosis of urinary tract infection in children that has higher sensitivity and specificity compared to other evaluated parameters such as IL-6, Nitrite, urine WBC count and plasma CRP. Due to high levels of sensitivity and specificity of HBP in the diagnosis of urinary tract infection in this study and its lack of implementation in Iran we have attempted to determine the level of HBP in children with urinary tract infection and healthy children.

In this study 35 children with culture-proven urinary tract infection and 25 healthy children with no symptoms suggestive of urinary tract infection referring to Children's Medical Center hospital in the years 2013-2014 were studied. The urinary samples of all children were cultured and analyzed by dipstick (to check leukocyte esterase and nitrites). To assess the level of HBP the samples after culture and dipstick were centrifuged for 1 hour and then Aliquot of supernatant was held at  $-70$  ° C until analysis. HBP test was performed by Enzyme-Linked Immunosorbent Assay.



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In this study, 35 patients were evaluated in the case group and 25 patient participated in the control group, among which 32 patients were female (53.3%) and 28 males patients were (46.7%). The mean age of the patient group is  $3 \pm 2.95$  years old and the mean age of the control group is  $2.7 \pm 4.39$  years old. HBP urinary level in the two groups showed significant differences in such a way that a urinary level of HBP in the case group was significantly higher than the control one. The level of HBP in both genders and different age groups showed no significant difference. Nitrite test is positive in 27 cases (45%) and in 33 persons is negative (55%).

In this study a very strong relationship was detected between HBP and positive nitrite. Also according to the analyses the sensitivity and specificity of nitrite are 77% and 100% respectively. Accordingly urinary nitrite test for diagnosis of urinary tract infection has low sensitivity and high specificity. In analyzing the level of urine WBC count, in 13 cases (21.7%) the number of WBCs was 20-40(43.3%), in 26 cases (8.3%), 40-60, and in 16 cases (26.7%), the number of WBCs was reported more than 60. Urine HBP level was significantly associated with the number of WBCs. Although all patients with increased WBC levels did not have high levels of HBP, however the interesting point is that among the patients without UTI but high WBC count (False positive) the level of HBP was lower than the Cut-off point and this makes HBP as a more specific marker than urine WBC count. In analyzing the frequency of bacteria in the case group 32 cases of Gram negative bacteria and 3 cases of Gram positive bacteria have been reported.

In the group of Gram-negative bacteria 18 cases (29.98%) Ecoli, 5 cases (8.32%) Klebsiella pneumonia, 2 (3.3%) Proteus mirabilis, 4 (6.72%) Enterobacter aerogenes, 1(1.6%) Entero coccus and 2 cases (3.3%) have been reported to have Pseudomonas aeruginosa. In Gram-positive bacteria group 2 cases (3.4%) Staphylococcus aureus and one case (1.6%) had Staphylococcus haemolyticus. The urinary HBP level was significantly increased in patients with high concentrations of bacteria. Also the level of urinary HBP infections with Gram-negative bacteria is higher than Gram-positive bacteria. These findings may indicate that bacterial structure is effective on HBP release. Also the level of HBP was directly associated with a positive urine leukocyte esterase. In Charlott Kjolvmarm et al. study (2012) patients with high levels of bacteria (more than  $10^5$ ) were also showed a high level of HBP. All patients with confirmed UTI had high HBP (more than 32 ng / ml). Using  $\text{ng/ml} \leq \text{cut-off}$  32 the levels of HBP sensitivity and specificity in detecting UTI was 93.3% and 90.3%.

Urinary HBP in patients with UTI is higher than patients with other types of infections which indicates the release of HBP caused by the activation of the WBCs. This was the first study on the role of HBP as a strong biomarker (1). Other studies have been conducted on the role of HBP as an early marker of sepsis with Circulatory Failure, the increased level of HBP in CSF of patients with bacterial meningitis and its increase in skin biopsies of patients with Erysipelas. Adam Linder et al. (2007) conducted a study on the role of HBP as an early marker of Circulatory Failure in sepsis. In this study, 233 adults with fever and suspected infection were selected and classified into 5 groups based on (Systemic Inflammatory Response Syndrome) SIRS criteria, Organ Failure and final diagnosis and the blood levels of HBP, Procalcitonin, IL-6, Lactate, CRP and WBC were measured. Plasma  $15 \text{ ng / ml} \leq \text{HBP}$  was a good diagnostic criteria for severe sepsis (with or without septic shock) compared to other parameters.

This test had the sensitivity of % 87.1, specificity % 95.1, PPV % 88.4 and NPV % 94.5 (12). Adam Linder et al (2010) conducted a study on the increased levels of HBP in patients with Erysipelas caused by Group A Streptococcus. In this study, 12 patients with Erysipelas were selected. These patients had a typical erythema on one of the lower organs and fever more than  $38^\circ \text{C}$ . The mean patient age was 61.5(29-88 years old). Patients had no history of previous Erysipelas malignancy, radiotherapy, immunodeficiency or taking immunodeficiency relief medicines.

The average time from the onset of the disease was 2 days (1-3 days) and all patients had received antibiotics. 2 punch biopsy specimens from the center were obtained from each patient and a skin biopsy was obtained from noninfectious areas and HBP level was measured based on Western blot HBP levels existed in tissue samples obtained from 11 patients. The result of this study indicated the increased level of HBP in infected areas compared





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with non-infective areas. These results suggest that infection with Group A Streptococcus leads to the activation of neutrophils and HBP release during a skin infection(11).Linder (2011) conducted a study on the role of HBP as an early marker in the initial diagnosis of acute bacterial meningitis.

In this study 174 CSF samples of patients with suspected central nervous system infection were collected. 37 Community-acquired acute bacterial meningitis patients, 4 neurosurgical bacterial meningitis patients, 29 viral meningitis or encephalitis patients, 7 Neuroborreliosis patients were in the case group and 97 people were the control subjects. CSF sample was analyzed in terms of HBP, Lactate, protein, glucose, neutrophil and mononuclear cells. HBP level was significantly higher in patients with acute bacterial meningitis (mean 376ng / ml) compared to other patients. (In patients with viral infection central nervous system the mean was 4.7 ng /ml and in Neuroborreliosis the mean was 3.6 ng /ml)

In this study the concentration higher than 20 ng / ml of HBP in the diagnosis of acute bacterial meningitis had 99.2% sensitivity and specificity of 100%.(10).HBP as a biomarker for the diagnosis of bacterial infections has been studied in many clinical studies. The increased level of HBP in plasma, cerebrospinal fluid, and skin biopsies is associated with severe sepsis, bacterial meningitis and streptococcal skin infections. Due to the high sensitivity and specificity of HBP in the diagnosis of urinary tract infection in children, this test can be added to the diagnostic tests that are currently being used in patients with suspected urinary tract infection (such as nitrite, leukocyte esterase, WBC, IL-6 and so on). It is proposed that HBP is used as a biomarker for UTI diagnosis also its application can be developed in categories of patients such as neutropenic fever and patients with urogenital pathology (13).

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**Table 1 - Association between HBP in the case and control groups**

|                    |         |               | HBP                     |          |
|--------------------|---------|---------------|-------------------------|----------|
|                    |         |               | 95% CONFIDENCE INTERVAL |          |
|                    |         |               | UPPER                   | LOWER    |
| Group<br>P = 0.001 | Case    | Mean          | 45.341                  | 22.5882  |
|                    |         | Std.Deviation | 40.4816                 | 22.02914 |
|                    | Control | Mean          | 7.0606                  | 1.9126   |
|                    |         | Std.Deviation | 10.54049                | 2.43713  |
|                    | Total   | Mean          | 29.3783                 | 13.9901  |
|                    |         | Std.Deviation | 36.55 68                | 19.47730 |

HBP level had no significant difference in both genders and different age groups (Table 2 and 3).

**Table 2 - The HBP Urinary tract in both genders**

|                |        |               | HBP                     |          |
|----------------|--------|---------------|-------------------------|----------|
|                |        |               | 95% CONFIDENCE INTERVAL |          |
|                |        |               | UPPER                   | LOWER    |
| Sex<br>P = 0.1 | Female | Mean          | 36.6637                 | 15.9965  |
|                |        | Std.Deviation | 41.43795                | 18.17634 |
|                | Male   | Mean          | 25.9610                 | 6.6619   |
|                |        | Std.Deviation | 34.22048                | 8.21706  |
|                | Total  | Mean          | 28.2713                 | 13.5074  |
|                |        | Std.Deviation | 36.16418                | 19.64267 |







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**Table 3 - HBP Level in different age groups**

|                 |       |               | HBP                     |          |
|-----------------|-------|---------------|-------------------------|----------|
|                 |       |               | 95% CONFIDENCE INTERVAL |          |
|                 |       |               | UPPER                   | LOWER    |
| Age<br>P = 0.09 | <1    | Mean          | 50.3718                 | 17.7068  |
|                 |       | Std.Deviation | 42.76181                | 20.94837 |
|                 | 5 -1  | Mean          | 29.1585                 | 8.6574   |
|                 |       | Std.Deviation | 39.31588                | 9.11399  |
|                 | > 5   | Mean          | 21.5888                 | 3.5925   |
|                 |       | Std.Deviation | 25.46233                | 3.92116  |
|                 | Total | Mean          | 29.3615                 | 13.9697  |
|                 |       | Std.Deviation | 36.62511                | 19.75409 |

The frequency of nitrite test in 27 positive cases is (45%) and in 33 negative cases is (55%).

**Table 4 - Frequency of nitrite**

|         | Positive nitrite | Negative nitrite |
|---------|------------------|------------------|
| Case    | 27               | 8                |
| Control | 0                | 25               |
| Total   | 27 (45 %)        | 33 (55 %)        |

In the case group 27 patients had positive nitrite and 8 subjects had negative result in nitrite test. In the control group all subjects had negative nitrite test. (Table 4)





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**Table 5 – Correlation between Urinary HBP and nitrite**

|                      |          |               | HBP                     |         |
|----------------------|----------|---------------|-------------------------|---------|
|                      |          |               | 95% CONFIDENCE INTERVAL |         |
|                      |          |               | UPPER                   | LOWER   |
| Nitrite<br>P = 0.001 | Positive | Mean          | 40.6493                 | 19.5430 |
|                      |          | Std.Deviation | 40.2626                 | 18.0026 |
|                      | Negative | Mean          | 20.2771                 | 3.2944  |
|                      |          | Std.Deviation | 33.5858                 | 5.4312  |
|                      | Total    | Mean          | 28.5705                 | 13.8483 |
|                      |          | Std.Deviation | 36.4764                 | 19.8989 |

HBP level was significantly higher in patients with positive urinary nitrite than patients with negative nitrite; as a result there is a significant correlation between the level of urinary HBP and positive or negative nitrite ( P = 0.001 ) (Table 5).

**Table 6 - Frequency of leukocyte esterase**

|         | Leukocyte esterase +1 | Leukocyte esterase 2+ | Negative leukocyte esterase |
|---------|-----------------------|-----------------------|-----------------------------|
| Case    | 19                    | 5                     | 11                          |
| Control | 0                     | 0                     | 25                          |
| Total   | 19 (31.7%)            | 5 (8.3%)              | 36 (60%)                    |

The frequency of leukocyte esterase has been reported negative in 36 (60%), 19 of patients were + 1 (31.7%) and 5 patients were + 2 (8.3%). 24 subjects of the case group had positive leukocyte esterase and 11 ones had negative leukocyte esterase. Leukocyte esterase in all controls is negative.





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**Table 7 – The relationship between HBP and leukocyte esterase**

|                                 |             |               | HBP                     |          |
|---------------------------------|-------------|---------------|-------------------------|----------|
|                                 |             |               | 95% CONFIDENCE INTERVAL |          |
|                                 |             |               | UPPER                   | LOWER    |
| Leukocyte esterase<br>P = 0.001 | Negative    | Mean          | 15.2025                 | 5.4490   |
|                                 |             | Std.Deviation | 23.36037                | 7.15797  |
|                                 | Positive 1+ | Mean          | 45.5526                 | 17.8392  |
|                                 |             | Std.Deviation | 42.16183                | 14.82353 |
|                                 | Positive 2+ | Mean          | 102.4618                | 17.2500  |
|                                 |             | Std.Deviation | 58.01803                | 0.03897  |
|                                 | Total       | Mean          | 29.0458                 | 13.8365  |
|                                 |             | Std.Deviation | 36.31915                | 19.61906 |

The urinary HBP level was significantly positive in patients with leukocyte esterase compared to subjects with negative leukocyte esterase. ( P = 0.001 ) (Table 7)

**Table 8 - WBC count**

|         | 20-0       | 40-20      | 60-40    | > 60       |
|---------|------------|------------|----------|------------|
| Case    | 0          | 16         | 3        | 16         |
| Control | 13         | 10         | 2        | 0          |
| Total   | 13 (21.7%) | 26 (43.3%) | 5 (8.3%) | 16 (26.7%) |

In analyzing the number of WBCs in 13 cases (21.7%) the number of WBCs was 20-40(43.3%), in 26 cases (8.3%), 40-60, and in 16 cases (26.7%), the number of WBCs was reported more than 60. In the case group 16, 3 and 16 subjects had the WBC of 20-40, 60-40 and above 60 respectively. In the control group 13, 10 and 2 subjects had the WBC of 0-20, 40-20 and 60-40.





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**Table 9 – Frequency of different types of bacteria**

|                       |                             | Group |         |
|-----------------------|-----------------------------|-------|---------|
|                       |                             | Case  | Control |
| Gram positive (5%)    | Staphylococcus aureus       | 2     | 0       |
|                       | Staphylococcus haemolyticus | 1     |         |
| Gram negative (53.3%) | Ecoli                       | 18    | 0       |
|                       | Klebsiella pneumonia        | 5     |         |
|                       | Proteus mirabilis           | 2     |         |
|                       | Enterobacter aerogenes      | 4     |         |
|                       | Pseudomonas aeruginosa      | 2     |         |
|                       | Enterococcus                | 1     |         |
| No bacteria (41.7%)   |                             | 0     | 25      |

From the standpoint view of the frequency of the bacteria in case group, 32 and 3 cases of Gram-negative and Gram-positive bacteria was observed respectively. In the group of Gram-negative bacteria 18 cases (29.98%) were Ecoli, 5 cases (8.32%) were Klebsiella pneumonia, 2 (3.3%) were Proteus mirabilis, 4 (6.72%) were Enterobacter aerogenes, 1 (1.6%) was Enterococcus and 2 cases (3.3%) have been reported to have Pseudomonas aeruginosa. In Gram-positive bacteria group 2 cases (3.4%) were Staphylococcus aureus and one case (1.6%) was Staphylococcus haemolyticus (Table 10).





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**Table 10 – The correlation between HBP and bacteria**

|                              |                  |               | HBP                     |          |
|------------------------------|------------------|---------------|-------------------------|----------|
|                              |                  |               | 95% CONFIDENCE INTERVAL |          |
|                              |                  |               | UPPER                   | LOWER    |
| <b>BACTERIA</b><br>P = 0.001 | Gram<br>Negative | Mean          | 48.1365                 | 24.3084  |
|                              |                  | Std.Deviation | 41.14857                | 23.97659 |
|                              | Gram<br>Positive | Mean          | 18.0000                 | 11.6400  |
|                              |                  | Std.Deviation | 4.49720                 | 0.00000  |
|                              | No<br>Bacteria   | Mean          | 98 7.43                 | 1.8146   |
|                              |                  | Std.Deviation | 10.74148                | 2.3277   |
|                              | Total            | Mean          | 29.3616                 | 14.4273  |
|                              |                  | Std.Deviation | 36.58401                | 20.68836 |

HBP level is significantly higher in the case group with positive urine culture compared to the control group. Also, the HBP is significantly higher in the positive urine cultures with Gram-negative bacteria than Gram-positive bacteria (Table 11). With regard the HBP level of 10ng /ml as cut off point , sensitivity and specificity in the diagnosis of urinary tract infection is 82.86% and 92% respectively. Also this test has the PPV and NPV level of 93.55% and 80%, respectively. In this study the nitrite test has a sensitivity and specificity of 77% and 100% respectively





## RESEARCH ARTICLE

## Study of Rumen Archaeal Diversity in Iranian Buffalo using Phylogenetic Analysis of 16S rRNA Gene Sequences

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Received: 21 Mar 2015

Revised: 19 Apr 2015

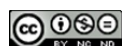
Accepted: 27 May 2015

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### ABSTRACT

Genetic diversity of archaea population which is resident in the rumen of Iranian buffaloes was identified using by modern molecular methods. It is probable that structure of archaea colonies of buffaloes show special characters and some differences, in comparison to the other ruminants because of their distinct diet and habitat. So that obtaining enough knowledge about archaea diversity in various breeds of buffaloes and their variations in response to diverse diets and also determination of archaea diversity in various environments is essential. Therefore a mixture sample of whole ruminal content of 12 northern Iranian buffaloes was collected. PCR amplification was done by specific primers of archaea and 16S rRNA gene clone library was sequenced. Samples were collected from herds that grazed near natural water resources. Totally fifteen sequences of 16S rDNA were analyzed and blasted. Phylogenetic analysis was performed using by multiple sequences alignments through CLUSTALW software. Phylogenetic tree was constructed by MEGA4 software. Seven sequences showed similarity to *Methanothermobacter*. Five sequences were similar to uncultured archaea from anaerobic digesters. One sequence was similar to *Methanobrevibacter*. One other sequence resembled to *Methanosphaerastadtmanae*. One sequence had similarity to uncultured archaea of goat rumen. This is the first study of molecular diversity of Iranian buffaloes methanogenic archaeal population. The results show that Iranian buffaloes have similar archaea such as other ruminants. Although we isolated some sequences which are not clustered to common methanogens. It may be as results of individual differences during sample collection, types of rations, methods of DNA extraction or used primers.

**Key words:** Rumen archaea, molecular diversity, Iranian buffaloes, 16S rRNA





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## INTRODUCTION

The rumen equipped with billions of symbiotic microorganisms such as bacteria, protozoa, fungi and archaea. Ruminants consume forages and supply required substrates for microorganisms. Then microbes ferment the substrates and produce energy and nutrient for themselves and host animal. Archaea are less than 4 percents of total microbial population of the rumen(1). Archaea are mainly consist of methanogens that belong to phylum *Euryarchaeota*(2). Methanogens use hydrogen as energy source and reduce CO<sub>2</sub> to methane and also provide other reducing factors for other metabolic pathways(3). The produced methane is released to environment by eructation and leads to energy losses of diet and as greenhouse gas which has important role in global warming. Among greenhouse gases methane has the most potential in global warming (4). Decrease in methane production is one of the most goals that should be considered to diminish global warming.

Proximate population of buffaloes (*Bubalus bubalis*) is about 170 millions in all of the world (5). Buffalo is one of the most important ruminant which is bred by farmers in various regions such as Asia, South America, South Europe and north of Africa. In Iran buffaloes play an important role in milk and meat production. All of Iranian buffaloes are water buffalo and about 480000 heads of buffaloes live in Iran (6, 7). Eighty percent of them are in the north and north western of Iran and 18 percent are in south of country (8). In the north, 25000 heads are in Guilan province and 5000 heads are in Mazandaran province (6). Diet of Iranian buffaloes are very diverse, but mainly they graze near natural water resources such as rivers, dikes and sluices and sometimes they are fed by bagasses or fruit wastages (7). The amount and digestibility of the diet are two main factors that affect methane production (8). Therefore it is probable that structure of rumen archaeal populations of buffaloes show special characters and some differences in comparison to the other ruminants because of feeding by unusual feedstuffs and grazing on natural forages and because of their life environment. Studies show that 7.5 to 9 percent of derived energy from the diet losses as methane in buffalo(9). Today using of methane inhibitors has limited methane production. It can be useful to improvement of animal output and decreasing global warming by methane inhibitors. Recently usage of methanogens inhibitors has been developed. But proper application of any methane reducing program depends on having enough knowledge about numbers, distribution and diversity of various species of archaea in the rumen of ruminants.

Disability of culturing based methods to detection and isolation of various species of archaea due to the failure in perfect reconstruction of *in vivo* conditions have been led to development of culture independent modern molecular approaches. The modern methods can detect and isolate vast ranges of microorganisms especially archaea in the ecosystems (10). Major part of archaea population of the rumen has been detected by sequencing of 16S rDNA gene clone library (11, 12). Based on our information this is the first study of methanogenic archaea diversity in Iranian buffaloes. We attempted to identify more diversity of archaea using different primers that have not been used in ruminal microbiology investigations before.

## MATERIALS AND METHODS

### Sample collection

Samples were collected from the rumen contents of native buffaloes from the north of Iran. The experiments were carried out on 12 adult Northern ecotype of Iranian buffaloes (six animals from Mazandaran province and six animals from Guilan province), approximately three years of old and with a live weight of 300±20 kg. Sampling was done in late of spring from grazer herds that never consumed supplement. To prevent the entry of non-native microbes to our sample that usually came with feed to the rumen, animals did not access to feed for 18 hours before slaughtering. Samples were taken just after the slaughtering. We collected samples from different segments of rumen to obtain maximum species of archaea. All samples of 12 ruminal contents blended to each other and a final 100g



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sample was provided and to preventing more microbial activity and producing of microbial enzymes, sample transformed quickly to  $-80^{\circ}\text{C}$  freezer.

**Total DNA extraction**

DNA was extracted from whole rumen contents. The rumen contents was thawed on ice and 500  $\mu\text{l}$  of DNG extraction solution (Cina Colon, Iran) was added to 400  $\mu\text{l}$  of ruminal content in 2.5 mL microtubes and vortexed for 15-20 seconds until samples were completely homogenized. 600  $\mu\text{l}$  of isopropanol was added to the microtubes and mixed well by vortex and hold 20 minutes in  $-20^{\circ}\text{C}$  and then centrifuged at  $16,000\times g$  for 5 min. Upper phase was discarded then 1000  $\mu\text{l}$  of wash buffer (70% ethanol) was added. After inverting, the samples were centrifuged at  $16,000\times g$  for 15 min. Finally after remove wash buffer, DNA of samples were dried by holding at  $65^{\circ}\text{C}$  for 5 min. DNA was dissolved in 50  $\mu\text{l}$  Tris-EDTA buffer (pH=8.0) containing DNase-free RNase (100  $\mu\text{g}/\text{ml}$ ) and stored at  $-20^{\circ}\text{C}$  until use.

**PCR procedures**

The primer pair used for PCR amplification of archaea was ARCHAEA Forward (TGAAACTTAAAGGAATTGGCGG) and ARCHAEA Reverse (TGTGTGCAAGGAGCAGGG). PCR was performed with each reaction involves 5 $\mu\text{l}$  of DNA, 2.5  $\mu\text{l}$  10X PCR Buffer, 1  $\mu\text{l}$  of each outer primer F1/R2 10mM, 0.75  $\mu\text{l}$  MgCl<sub>2</sub> 50mM, 0.5  $\mu\text{l}$  dNTP (dATP, dCTP, dGTP, dTTP) 10mM, 0.4  $\mu\text{l}$  5U/ $\mu\text{l}$  Taq DNA Polymerase in a total volume of 25  $\mu\text{l}$ . The PCR reaction was conducted in a Mastercycler 5333 (Eppendorf, Germany). The amplification conditions were: one cycle at  $95^{\circ}\text{C}$  for 3 min for initial denaturation, then 35 cycles of  $93^{\circ}\text{C}$  for 30 s,  $55^{\circ}\text{C}$  for 30 s and  $72^{\circ}\text{C}$  for 1 min. The PCR products were checked by electrophoresis in 1.0% agarose gels and stained with 0/0001 SYBR safe (Cina Colon, Iran).

**Cloning and sequencing**

PCR products were cloned in pTZ57R/T vector (Fermentas, UK) according to the manufacturer's instructions and transformed into *E.coli*/DH5 alpha competent cells. The recombinant plasmids were then extracted by the Plasmid Extraction kit (CinaColon, Iran). Nucleotide sequences of cloned genes were determined by sequencing at BIONEER corporation, Daejeon, South Korea.

**Sequence and secondary structure analysis**

All origin sequences were obtained from the Gen-Bank and RDP (Ribosomal Database Project) (13). CHECK\_CHIMERA program (14) was used to eliminate any un-real rRNA gene colons. Degree of similarity was checked on data base by using online BLAST search(15) and the most similar sequences were chosen as reference sequence.

**Phylogenetic analysis**

Two Crenarchaeotas which call *Sulfolobus acidocaldarius* and *Thermoproteustenax*, were used as outgroups. Sequence have been aligned by using multiple sequence alignment software CLUSTAL W(16) and a phylogenetic tree was drawn by MEGA4 (<http://www.megasoftware.net/mega4/mega.html>) software to illustrate the evolutionary relationships by using the neighbor-joining method(17). The tree was bootstrapped for 100 repeats (18).







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## RESULTS

### Sequence analysis of archaeal 16S rRNA clone libraries

Fifteen 16S rDNA sequences were analyzed. Sequence similarity show that all of the sequences belonged to methanogens. They ranged all known diversity of our library. Seven sequences (46.66 % of clones) consisting of clone 23, clone 4, clone 11, clone 25, clone 44, clone 21, clone 45 were similar to *Methanothermobacter*. Five sequences (33.33 % of clones) consisting of clone 14, clone 29, clone 20, clone 8, and clone 6 were similar to uncultured archaea from anaerobic digester. One sequence (6.66 % of clones) consisting of clone 34 resembling to *Methanobrevibacterolleyae* strain KM1H5, one sequences (clone 17) was similar to *Methanosphaerastadtmanae* and one sequence resembling an uncultured archaeon from the rumen of goats(clone 28).

### Phylogenetic of archaeal 16S rRNA clone libraries

The results of phylogenetic placement of these fifteen sequences are shown in Fig. 1. The clone 14, clone 29, clone 20, clone 8, and clone 6 are in cluster that has close relationship to *Methanobrevibacter* genus; although there were not any reference sequences of uncultured species with close relationship to describe its taxonomy accurately. The clone 34 and 17 were closely related with a *Methanobacterium* sequence. Five clones, clone 14, clone 29, clone 8, clone 20, clone 6 were very unusual (Fig. 1). These clones were grouped as unclassified archaea and have very low similarity to cultured methanogens. In general, archaea primers are less specific and may have high amounts of bacteria(19).

## DISCUSSION

In the rumen of ruminants, methanogens play a significant role in global warming, because 6 percent of consumed energy is lost as methane gas. Methane is an end product of rumen fermentation and a cow can produce 170 liters methane per an hour (20). Up to 2008, methanogens had been classified to 28 genera and 113 species but only a few number of them were isolated from the rumen(21). However, in the present study we found a few number of methanogens in our library and none of the 15 clones showed total similarity to the gene bank sequences. This may be as a result of many factors such as sampling procedure, DNA extraction methods, designed primers, PCR cycles and the other related factors. In addition, it is probable that due to complicated rumen microbial ecosystem and specific ingredients of methanogens cell wall, the DNA of some methanogens are not extractable or sometimes extracted DNA is too low for PCR amplification.

Almost all detected methanogens of the rumen are those that can produce methane from hydrogen and carbon dioxide. In comparison to other methanogens they can produce more methane, because they grow faster and they have short retention time in the rumen. A lot of molecular investigations which were based on 16S rRNA genes indicated that in the rumen of cows and buffaloes and even in the forestomach of alpacas, most of detected sequences of methanogens were belonged to *Methanomicrobiales* and *Methanobacteriales* that are classified in hydrogenotrophic methanogens and can produce methane from H<sub>2</sub> and CO<sub>2</sub>(22, 23, 24). Singh et al.(23) reported that in the buffalo rumen, 48% of clones belonged to *Methanomicrobiales*, 48% belonged to *Methanobacteriales* and only 4% belonged to *Methanosarcinales* (acetoclastic methanogens). Part of our results corresponded with their result that we seen 46% of clones belonged to *Methanobacteriales* (total of *Methanobrevibacterolleyae*, *Methanosphaerastadtmanii* and uncultured archaea from anaerobic digester that was in cluster within *Methanobrevibacter*), but part of our results doesn't have any agreement with their result because we don't identified any clones from the *Methanomicrobiales* and *Methanosarcinales*. That may be due to differences in sample preparation, animal diet or geographic region. This finding is consistent with reports of Wright et al. about methanogens population in the crop of goat(25). Also Wright et al. (26) observed only sequences of 16S rRNA gene that were related to *Methanobacterium* and *Methanobrevibacter* in the rumen of sheep and their result showed the absence of sequences related to



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*Methanomicrobiales* and *Methanosarcinales* that is in agreement with our results. On the other hand 47 % of our identified clones belonged to *Methanothermobacter* that have not been detected in any ruminant digestive system. *Methanothermobacter* is a member of thermophilic methanogens that can produce methane and live in a hot habitat with near water boiling temperature (27). All of the thermophilic methanogens are in order *Methanobacteriales* and belonged to genus *Methanothermobacter*. On the basis of our knowledge all of these methanogens to date isolated only from anaerobic hot spring (28), sewage sludge (29) and warm volcanic environments (30). Observing of these methanogens in our findings is probable as result of unique weather conditions of the north of Iran and maybe due to existence of a large number of natural springs specially hot springs in these area and feeding of buffaloes from forages near these springs as well as drinking water from these resources.

In the present study only 6.6 % of clones were belonged to *Methanobrevibacter*. *Methanobrevibacter* is the predominant genus of methanogens. It has been not only isolated frequently by cultural based systems (31) but also has been represented by most molecular studies (32). Many studies pointed out to *Methanobrevibacter* in extracted 16S rRNA gene clone libraries in the rumen of cattle and sheep (33, 34) but some of them reported the lack of this kind of methanogen in the rumen of cow and buffalo (35, 36, 37). However many researches considered *Methanobrevibacter* as dominant genus of poultry ceca (38), termite hindgut (39) in the rumen (26, 40) and in the crop of some birds (25). Those results are inconsistent to our findings because in our research a few numbers of clones was related to *Methanobrevibacter*. 6.6 % of clones in our study had 86 % identity to *Methanosphaerastadtmanae*, which has been identified in the rumen of cattle and sheep by others (35, 41). *Methanosphaerastadtmanae* is a residential methanogen of human large intestine (42), but Withford et al. isolated it from the rumen of cows for the first time (43).

34% of our extracted clones showed similarity to uncultured archaea from anaerobic digester (19). Although these clones are in cluster that has close relationship to *Methanobrevibacter* genus but existence of such sequences in genome library maybe due to entering of other microorganisms to the rumen via diet. To prevent the entry of these microbes to the rumen, animals did not access to feed for 18 hours before sampling. But maybe because of high retention time of roughages in the rumen and due to repeated use of these feeds by buffaloes in the nature, these contaminating microbiota have enough time to replacement in the rumen. The remaining 6 % of clones were resembled with uncultivated clones populating the rumen of goats (44).

## CONCLUSION

It seems our study provides inclusive knowledge about methanogens diversity in the rumen of Iranian buffaloes. Results show that Iranian buffaloes have similar archaea population to the other ruminants of the world. Nevertheless observing some unusual methanogens in the rumen maybe due to grazing of buffaloes with decomposing plants near water sources like springs, streams and lakes and perhaps because of drinking of water from these natural sources. However, Further studies is needed to investigate methanogen diversity in buffaloes rumen during various seasons, and in different area of the country specifically in north western of Iran which main populations of Iranian buffaloes live there. Moreover, it will be useful to examine methanogens diversity in buffaloes that are fed by concentrate and supplemental feed. It helps us to increase our knowledge about microbiology of the rumen and therefore we can achieve enough information about effects of interactions between rations and environment over the methanogens and methane productions. Consequently we can choose correct program for mitigation of methanogenesis in the rumen of ruminants.

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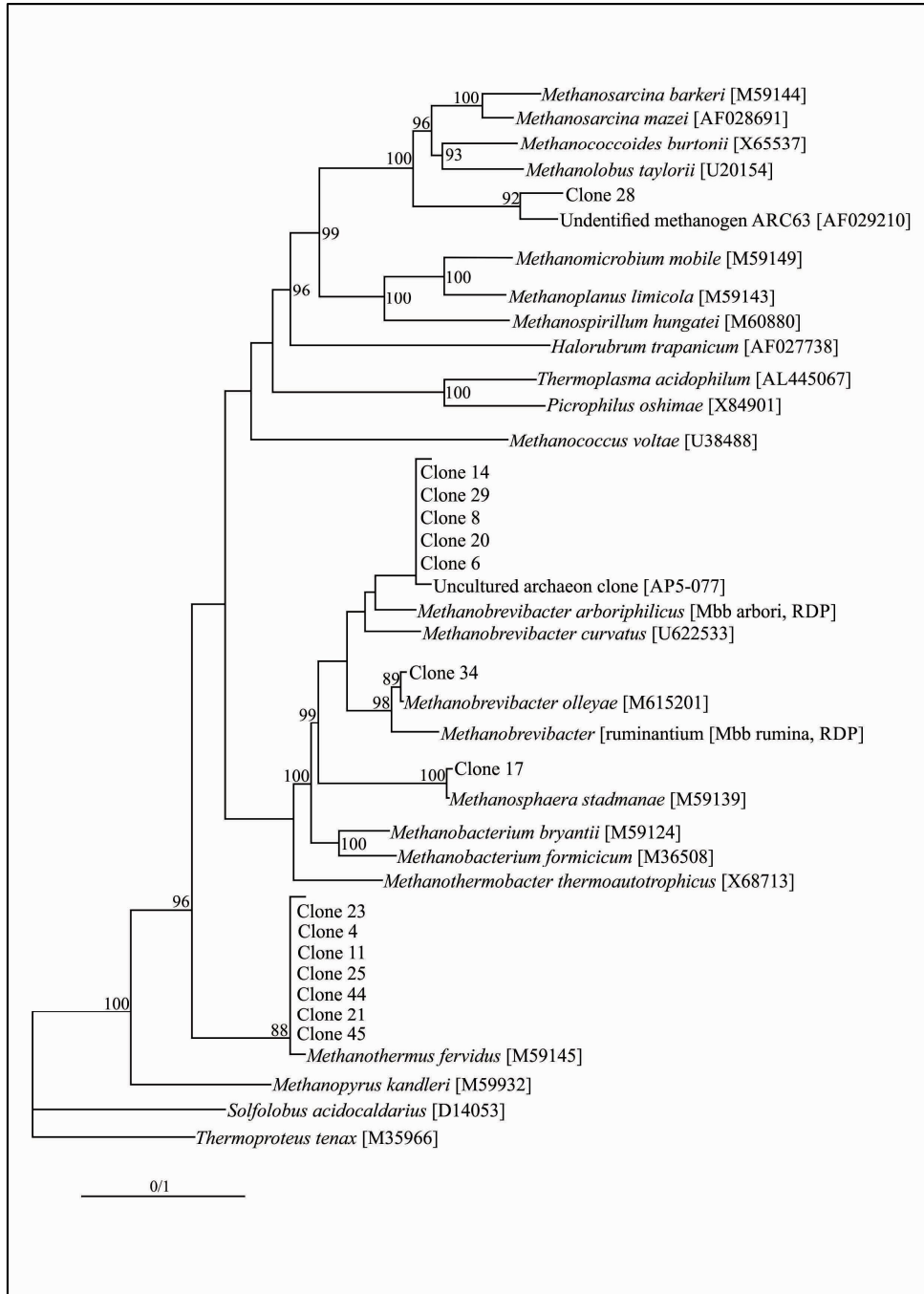
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**Fig. 1.** Phylogenetic placement of archaea sequences. The database sequences have the GenBank and RDP accession numbers in brackets; our sequences are shown with clone. The numbers around the nodes are the confidence levels (%) generated from 100 bootstrap trials.





## RESEARCH ARTICLE

## A Comparative Survey of the Relationship between Reason and Faith from the Perspective of martyr Motahari and Kierkegaard

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Received: 25 Mar 2015

Revised: 18 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

Reason and faith are both a gift from God. Reason is the essence of the human beings and the definition of modern life is based on rationality. On the other hand, faith makes human life richer and gives it meaning. These two sometimes look incompatible and each individual is forced to choose one of them as the effective factor in his or her life. In this case, we will be faced by two completely different choices: Modern life based on rationalism, or committed faith with downgrading reason. But some people believe that these two factors are not only compatible but interdependent and of course each of these groups has their own reasons. Soren Kierkegaard, Danish thinker, advocates extreme fideism and chooses devoted faith at the expense of sacrificing the reason, while Martyr Morteza Motahari, prominent Iranian philosopher, believes that reason and faith are interdependent and complete each other. With this view, it is possible to incorporated modern rationality with the beauty and tranquility of living faithfully which requires the freedom of reason from sensuality.

**Keywords:** reason, faith, fideism, rationalism, martyr Motahari.

### INTRODUCTION

Studying conflict or compatibility between reason and faith is still a serious problem of human society since human beings will always need them both. Reason distinguishes man from other animals; although, today reason and rationality are not used in the conventional sense, but rather in a tool sense. In conventional sense, reason is the essence of human beings, makes him reach perfection and particularly controls carnal desires. But in its new meaning, which is given to it in the twentieth century, reason is an instrument which helps human beings in achieving instinctive or in other sense animal demands. But the reason is, however, the human reason and as soon as





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superior wishes are raised, reason will go towards transcendent. Now the question is the role of reason and faith in human life and how to solve the problem of conflict between them, and is there really such a conflict? If so, which one should be prioritized? Should we shut down reason and obey religious commands? Should we dismiss religion due to being irrational or against reason and consider its time elapsed? The present study refers to the views of two prominent religious-philosophical characters (martyr Motahari and Kierkegaard) in answering these questions. One of these views belongs to Islam and the other belongs to Christian field. Therefore, we should make a brief reference to views of these religions which are both Abrahamic in discussing these questions.

#### The view of Islam and Christianity about the relationship between reason and faith

These two religions are among the Abrahamic religions and today, they have the most expanded scope of influence and plurality of followers. Each of them have considered these questions with their own views which arose from their common teachings among followers and especially their scholars and scientists and have reached some conclusions which are sometimes different from one another. This difference in views has certainly affected the opinions of our chosen philosophers and therefore they should be briefly mentioned.

#### Comparing Islam and Christianity in the matter of faith and reason

Aside from reasons mentioned above, there is a clear and obvious difference between Islam and Christianity. As Kierkegaard believed (and the common idea of the church), incarnation or reincarnation is the most fundamental issue of the Christian faith. First and most important belief that a Christian should have is that God appeared in the form of Jesus of Nazareth among people and he suffered to make atonement for the sins of his believers. But God, as theologians define, is eternal and invariant and it is impossible for him to be a component of historical world. It is clear that this apparent paradox about God having a history is not acceptable to reason and logic. But Kierkegaard responds according to Tertullian: " I believe the same thing which is pointless and weak."

There is no such opinion among essential and minutiae principles of Islam which believe in it requires contradiction. Therefore, even without mentioning reasons, we can consider Islamic faith and reason aligned. While those Christians who believe in the Incarnation (Which includes the majority and Kierkegaard), faith cannot be in line with reason which will be explained later. In addition, one of the differences between Islam and Christianity is that historically "even the oldest documents and resources of Christian history is mixed with religious and mythological beliefs." Therefore, these documents are not reports about Jesus, but rather narratives about what the early Christian community believed about Jesus. But Muslim or non-Muslim historians believe that everything about the history of the Prophet Muhammad is clear and obvious.

#### Studying the difference between Motahari and Kierkegaard views in relation to reason and faith

Despite the obvious and important differences between common beliefs of Islam and Christianity which were mentioned above, there exists a belief regarding compatibility or incompatibility of faith and reason between Muslims and Christians from which, different categories of belief regarding compatibility and incompatibility of these two or reasons and consequences of them can be obtained. Currently, it is enough to say that the difference between these two philosophers' perspectives isn't merely related to Islam and Christian intellectual origins, since many Christian scholars have tried hard to rationalize Christian faith or demonstrate it as a rational religion. One example is Thomas Aquinas and his old and new followers or followers of liberal theology. Even some Muslim groups have considered the realm of reason and faith separate and believe that reason is like a bridle and the leg of arguments is wooden. Even some consider believing in reason the cause of seduction, including mystics and a number of speakers and extremist groups such as Ashaere and Akhbarioun. However, Motahari can be regarded as representative of having the idea of faith and reason compatibility in Islamic sphere and Kierkegaard is the representative of faith and reason incompatibility idea in Christian sphere.





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#### The definition of faith from the perspective of Kierkegaard

In "Desperation towards death", Kierkegaard expresses a situation in which there is no insubordination. This situation is expressed as follows: "with relating self to your own ego and with the desire to be yourself, your ego expands in a strength which has formed it." As you can see, this rule is the definition of faith. (N- K, Desperation towards death, pp. 206, 36 and 22) To define faith according to Kierkegaard, this sentence may be louder than all: "Abraham is the father of faith" (trembling) Also, he offers a definition of fact which he believes is the description of faith at the same time. "The truth is precisely the dangerous issue of choosing extroversive uncertainty with the passion of the inner journey." Because he believes that when we examine the nature, we see both the signs of God's absolute power and wisdom and other things which disturb us. Therefore, we become uncertain. But at the same time, we can believe, because this faith requires taking risks and according to him, there is no faith without taking risk. He considers faith as the contrast between limitless passion of inner journey and extroversive uncertainty and he emphasized that in order to keep our faith, we should always keep this condition (R-K, the same).

These ideas show Kierkegaard's view of faith and clears that his definition of faith is not only far from the definition of martyr Motahari and Islamic Studies, but is also quite different from other Christians' view. Although his definition is somehow similar to the mystical love, it's even distinct from that. After describing their similarities, we explain this distinction.

#### Relationship between science and faith from the perspective of Kierkegaard

It was mentioned that martyr Motahari considers science an aspect of reason, but it can be said that Kierkegaard considers science – meaning recognition and identification- an aspect of faith. To prove this claim, his discussion about philosophical parts can be used. Which is the nickname of the author, asks three questions because he believes that the solution to human problems is somehow in finding a link between historical life and identifying eternal and timeless happiness:

1. Can primordial awareness and wisdom have historical origin?
2. How can such an origin and point of departure have another interest other than mere historical?
3. Is it possible to found eternal happiness according to historical identification?

To answer these questions, he first refers to identification theory of Socrates which is proposed by Plato: Socrates believed that if we don't know something, we will never be able to learn it because after its identification, we will not be able to recognize that this response is the unknown we've been looking for. In other words, identifying the correct answer from the wrong one requires a kind of prior correct answer and if the person doesn't know anything about what he wants to identify, true identification is not possible for him.

#### Comparison of faith and reason from the perspective of Kierkegaard

How does faith arise? What is the role of reason in its emergence? What is the role of reason after the emergence of faith? Does it help faith and promote it? Or on the contrary, undermines faith and builds doubt?

Answering these questions depends on the function of reason and reason can have various functions in relation to faith. In order to simplify, we consider reason as discursive argument and refer to some of its positive functions and then we analyze them again with Kierkegaard's point of view.

One of the major benefits of the reason is that it shows human beings they need faith. Of course the main attraction is inner and from heart but it is reason that can demonstrate how much the need to worship and praise is among certain needs of human beings. Faith is needed for this worship and prayer. The other function which is more important is that reason can prove our faith is a valuable and indubitable fact by means of discursive arguing. Such as proving the existence of God, or that human beings need prophets and God has sent prophets and scriptures due





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to his effective wisdom. The other function of reason is that in reviewing scientific and historical evidence, it can prove that they actually happened. For example, prophets have come and have claimed prophecy and they have brought signs and miracles to prove their claim. Although in Christianity, according to Kierkegaard and most Christians, God at some point (first century AD) became embodied as a human and he suffered so that human beings who are sinners by nature start believing and their sins become erased due to faith. Whether reason can prove or even accept this idea is discussed under rationality of Christian commands title.

**Reason and faith in the unseen from the perspective of Motahari**

As mentioned, human beings are rational and this is their most important feature among other animals and they own the crown of dignity. On the other hand, their individual and community perfection necessities and what makes them find their rightful place in the world is faith. Therefore, reason and faith are two elements that cannot be ignored. Now we should see that whether they can be summed up or not and if not, should we prefer one and use the other as a means to serve the other or put it aside completely. In this case which one is preferred and which one should be overlooked? And if they can be summed up, what is the proper mechanism?

Matters which cannot be accessed by senses and in other words, they are not certainties achieved by feeling or experience, and also reason cannot prove their accuracy immediately by arguments are considered irrational or at least they are not considered rational, whether they are news propositions, such as news of the unseen or the news of presence or absence of objects or even type of formulas, such as doing something or not. However, if we closely look at these issues which seem irrational at first, some of them are anti-reason. It means they are impossible to do or be correct, however some impossible issues are not rational but there is no reason either for or against it.

Islam has never asked his followers to believe in rationally impossible issues, but since its audiences are always wise, they never accept such beliefs which are inconsistent with wisdom and reason. Although the second type is not admitted easily by reason and in fact, there is no ready proof for it, there is no proof to reject them either. Such as factors other than our tangible world or entities other than the organisms that we know or even physical and chemical laws other than what we've been accustomed to. Reason immediately acknowledges their existence, but with more consideration, there is no reason to find them impossible. It seems that what is called unseen by Quran and believing in it is necessary for its followers belongs to such matters. The biggest challenge of religions with their opponents was miracle. Opponents of the religion had strong reasons and there were no convincing answers. In order to explain this, the master says that some people do not understand the secret of miracle and although they want to accept Quran, they deny it as a miracle and generally don't accept miracles in this world. and they try to justify that the master means this is denying Quran because it has quoted numerous miracles of the past prophets and in addition to considering them miracles, introduces itself as the last miracle. Therefore we should accept its invitation to thinking and reasoning and contemplate about miracles in general and miracle of the Qur'an in particular and discover its secret which is one of the great Islamic secrets.

**Comparing the two approaches of martyr Motahari and Kierkegaard**

In addition to the individual character and religious differences which is the result of different religious and geographic environment, one of the great differences between their characters is that Motahari is a logical person and this logic has formed all his opinions and life. This means that as he holds a proper place for reason, all his life and thoughts are rational and wisely and also his speech and writing. But Kierkegaard, who is an existentialist, is romantic in speech and writing like other existentialists.

If we want to examine Kierkegaard's scientific personality and ideas with rational measures and argumentative defense, there is nothing defensible more than his academic process. But if we want to show more empathy and look





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at the issue with his point of view, we have to accept the tremendous differences between these two philosophers. Therefore, we will try to translate them to each other as much as possible.

Another major difference between the two philosophers is that Kierkegaard's approach to religion is new. His traditional approach to religion is obvious and severe. Don Cupitt, the author of sea of faith says: "Kierkegaard is one of the thinkers who have removed religion from its ancient dogmatic form and instead of believing in absolute recognition and the existence of moral order he has tried to introduce faith as a spiritual path which reflects any religious pluralism, so that rather than a religion and way of life, it expands the spiritual richness of life. He adds that such attitude continued with Nietzsche, Albert Schweitzer, Jung and Wittgenstein. Therefore, religion is removed from its traditional dogmatic form and is considered merely for filling the spiritual vacuum in their lives and not as dos and don'ts which affects social or material life.

Motahari was a relentless critic and fighter of deviations from the original Islam, and he didn't tolerate any historical distortions or distortions of his counterparts. But he never had such an attitude towards religion, rather defends concepts such as truth, absolute recognition and ethics and their relativity more vigorously and believes that recognition of human beings and world is certainly deserved by human understanding. He believes that human beings can reach a place where they can understand the hidden secrets of the universe. Although in this big sea, it is not possible for everyone to be a captain and the number of people who reach certainty is less than people who are victims of struck and straying waves – which are dragons wherever there is a way – and there are many bandits in this way that prevent man from climbing to the top of the perfection peak and beach of joiner. As we know,, these shipwrecks, More than anything, have non-cognitive reasons.

Another difference which we can name here is the extent of topics addressed by Motahari. However, they all revolve around a certain topic which is Islam and the Shia religion. These issues are relevant to all aspects of human life, hence Islam is the maximal religion and Shi'as in particular, discusses more topics about artificial spiritual life of the individuals. But in the case of Kierkegaard we are not faced with such extent and there are other dimensions of his cultural and intellectual character which can be considered apart from his religious character. He is considered an existentialist and in fact the first one, although he knows man only in his relationship with God. Due to his smart understanding of time and his prophetic analysis of developments in the nineteenth century sometimes he is considered among four predictors of future which are Kierkegaard, Nietzsche, Dostoyevsky and Kafka. In this classification it is not important whether he is a devout and passionate Christian or against any religion. In case of Mr. Motahari, it is impossible to notice an intellectual or revolutionary dimension which is not included in his religious character.

## CONCLUSION

Despite their obvious differences in personality, thoughts and even religious and cultural backgrounds, both of these philosophers have worked diligently to examine the role of faith in human life, and human beings and their perfection has been their concern. Faith in God and man's proper relationship with God through serious piety and worship and fighting any pretense and hypocrisy and inflexible reason is a matter of concern for both of them and none of them considers a faithless person complete. But perspectives and methods often have been different and they are more than the expected difference between these two philosophers. One of the main differences which are the theme of this paper is the difference of view between Motahari and Kierkegaard about reason, faith and their relationship with humans and with each other. With a little neglect, the angle of this difference seems hundred and eighty degrees. According to Motahari, a person blessed with faith can be considered complete and up to this point he agrees with Kierkegaard. But, Motahari defines faith as "consciousness about God with orientation and





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submission" and believes that reason repairs faith, because the first element of faith is indeed knowledge. He refers to the valuable place of discursive and argumentative recognition and says: Prophets have come to give content to the human intellect and conveying is not just for sense. In addition to conveying content to reason, there is another round which is conveying to the heart. Also, he considers faith based on full certainty, although real faith is more than certainty, and modesty and obedience is necessary to ensure the faith. Therefore, although reason is not sufficient, it is necessary for faith. Faith is not complete without the help of reason unless it has passed the rational steps and reason admits that it is not in its jurisdiction.

Kierkegaard also considers having faith as the highest rank for human beings but he believes that faith doesn't need reason, rational arguments and evidence, but rather considers rational reasoning, with a great emphasis, prevention from any real faith. In this way, the uppermost stage of faith comes when it is truly unlike rational evidence and reason not only refuses to accept it, but it seems exactly opposite reason and impossible. In this case, the intensity of faith will be more and actually, a strong will is needed to believe despite these contradictions. This would be the highest stage of faith. In addition to this major difference, there is another difference about the role of religion in personal and social life of man, the role of ethics in personal and social and religious life, role of religious scholars in promoting religion and basically, the method of dealing with religious issues, especially theological distortions and deviations between Islam and Christianity and church. Another important difference is in the way of dealing with issues. Motahari's method is based on realism and realistic way of dealing with concepts. He solves the problems by concepts, links and logical conclusion and in this way communicates with the audience. That's why the concepts discussed with any degree of difficulty, are understandable and have fewer allegories. Unlike Kierkegaard who expresses even the simplest things with complex words and similar expressions. Therefore, interpretations of his philosophy are very different and sometimes contradictory. He is willing to communicate indirectly and in contrast, Motahari considers high peaks and unattainable positions, which can be achieved by few people. But Motahari defends it more intensively in matters such as truth, absolute knowledge of ethics and their relativity or believes that human understanding deserves certainty of human recognition.

One of the similarities between Motahari and Kierkegaard is that they both recognize true freedom in moral life and not in aesthetics. This means that a person is free when he attempts to understand and change himself on his own. "Static method pays attention to the outside world and expects everything from the outside, so it is passive and devoid of freedom."

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## RESEARCH ARTICLE

## Investigating the Relationship between Organizational Learning and Creativity of Teachers in Middle School Girls of Kerman

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Received: 25 Mar 2015

Revised: 27 Apr 2015

Accepted: 29 May 2015

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### ABSTRACT

This research designed to investigate the relationship between organizational learning and the teacher's creativity in Kerman city 1 st district girl's guidance schools. This inquiry is an applied- base objective and a correlation - base nature / methodology. The population comprises the above schools teachers, the number of them added up to 336 individual's in 2014. The sample includes all the population which studied in ensues manner. The data gathering tools have been 2 standard questionnaires. The findings show that the organizational learning (plus its components) is positively and significantly linked to the teacher's creativity. Meanwhile, in order to improve the organizational learning status and promoting the teacher's creativity. Some constructive recommendations offered to the coherent authorities.

**Key words:** Organizational Learning, Creativity of Teachers, Schools girls, Kerman

### INTRODUCTION

Education as the basis and foundation for the development of cultural, social, economic and political community. Today, in most countries, education is a growth industry. After much public funding allocated to the defense. Since a significant part of the education takes place in schools. School as a social system is critical if schools have a special place they can bear a daunting task, which is the best way to do that is healthy and dynamic organizations (Martinez and Blanch, 2003, Alagheband, 1999). One of the best and most obvious indicators of organizational health, organizational effectiveness, The procedure to create a new sound, moving toward a new goal, a new production runs, And their transformation over time tends to be different. Can be said to remain constant change and grow and develop. Refurbishing attribute their organizational health (Alagheband, 1999). Business world, changes from the dominance of investment in knowledge supremacy. An organization should develop its human resources and should increase its amount of information and knowledge in order to outreach the other organizations. Employees and their





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knowledge are a valuable resource for the organization. Hence, organizational learning and knowledge production have been taken into consideration in recent years (Paajanen&Kantola, 2008). Many organizations have detected the solution in increasing organizational learning and empowerment programs and they have tried to overcome internal and external obstacles and create the context for fostering employees' empowerment by implementation of these programs along with modifying variables affecting individuals' feel with use of learning and individual empowerment (Zare, 2006). Organizational learning is the capability "within an organization to maintain or improve performance based on experience. This activity involves knowledge acquisition (the development or creation of skills, insights, and relationships), knowledge sharing (the dissemination to others of what has been acquired by some), and knowledge utilization (integration of learning so that it is assimilated and broadly available and can be generalized to new situations)" (Pokharel and Choi, 2015). Organizational learning is the process by which the organization increases the knowledge created by individuals in an organized way and transforms this knowledge into part of the organization's knowledge system. The process takes place within a community of interaction in which the organization creates knowledge, which expands in a constant dynamic between the tacit and the explicit (Wall 2005, Nonaka and Takeuchi, 1995). The development of new abilities and knowledge and the increase in the organization's capability enable organizational learning. Organizational learning involves cognitive and behavioral change. More than ever, organizational learning has become a need rather than a choice. Inability to learn is the reason most firms disappear before forty years have passed. The aim of this study was to the study of relationship between organizational learning and creativity of teachers in middle schools of Kerman.

#### Principal Hypothesis

There is a significant relationship between organizational learning and creativity of teachers in middle school girls.

#### Secondary Hypotheses

- (1) There is a significant relationship between individual skills and creativity of teachers in middle school girls .
- (2): There is a significant relationship between mental skills and creativity of teachers in middle school girls.
- (3): There is a significant relationship between shared vision and creativity of teachers in middle school girls.
- (4): There is a significant relationship between team learning strategy and creativity of teachers in middle school girls.
- (5): There is a significant relationship between systematic thinking and creativity of teachers in middle school girls.

### METHODOLOGY

A descriptive, quantitative, co relational design was used. Statistic population of research concludes teachers of middle school girls in an area Kerman. The population consists of 336 teachers. A data collection instrument is included demographic questionnaire, questionnaire of organizational learning and creativity of teachers. The teachers answered the same questionnaire including standard questionnaire Senge's(1992)(including 24 questions) and standard questionnaire Torrance (1980)( including 20 questions). The Cronbach's Alpha that obtained from the pilot data was 0.86 for organizational learning and 0.84 for creativity of teachers. Data analysis included descriptive statistics, pearson's r and spearman's correlations, regression analysis, ANOVA analyses and SPSS software (package of Spss / pc + + ver21).

#### Demographics Results

- (1) Of the 336 subjects enrolled in the study, 66 were single and (19.6%) and 270 were married status (80.4).
- (2) The education level of 336 subjects were studied, 1.8% (6 cases) diploma, 20.5% (69) AA. 70.8% (238) BA and 6.8% (23) MA.
- (3) 336 subjects were studied, 17.9 % (60) less than 30 years, 31.5% (106) between 31-40 years, 46.1% (155) between 41-50 years, 4.5% ( 15) 51 years and older.





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(4) 336 subjects who were studied, work experience of 19.6 % (66) was less than 10 years, 20.6% (69) of 11-20 years and 59.8% (201) over 21 years.

## RESULTS AND DISCUSSION

### Principal Hypotheses

The results of this study show the correlation coefficient between the two variables is 0.249. According the results, there is a significant relationship between organizational learning and creativity of teachers (Table 1). Thus  $H_0$  is rejected and research hypotheses is approved. It means that with increasing organizational learning was increased creativity of teachers. These results are in good agreement with result Lozano (2014), Mohammadi (2006) and George (2009) reports that there is a significant relationship between organizational learning and creativity and innovation variables. The organizational learning has a positive effect on creativity and innovation variables. When most schools have a high organizational learning, creativity of teachers is also at a high level.

### Secondary Hypotheses

#### **(1): There is a significant relationship between individual skills and creativity of teachers in middle schools**

$H_0$ : There is not a significant relationship between individual skills and creativity of teachers in middle schools

$H_1$ : There is a significant relationship between individual skills and creativity of teachers in middle schools

According the results of Pearson's test, the correlation coefficient between two variables is 0.277. Thus there is a significant relationship between individual skills and creativity of teachers (Table 2). Thus  $H_0$  is rejected and research hypotheses are approved. It means that with increasing individual skills was increased creativity of teachers. These results are in compliant with result JavanMard and Sokhaie (2009) finding that there is a significant relationship between individual skills and organizational performance. Also there is a positive relationship between the individual skills and organizational learning and innovation.

#### **(2): There is a significant relationship between mental skills and creativity of teachers in middle schools.**

$H_0$ . There is not a significant relationship between mental skills and creativity of teachers in middle schools.

$H_1$ . There is a significant relationship between mental skills and creativity of teachers in middle schools.

According the results of Pearson's test, the correlation coefficient between two variables is 0.278. Thus there is a significant relationship between mental skills and creativity of teachers (Table 3). Thus  $H_0$  is rejected and research hypotheses are approved. It means that with increasing mental skills was increased creativity of teachers. These results are in compliant with result JavanMard and Sokhaie (2009) and Lozano (2014) reports that the creativity and organizational learning can help to challenge of traditional mental models Newtonian and development of stable community.

#### **(3): There is a significant relationship between shared vision and creativity of teachers in middle schools.**

$H_0$ : There is not a significant relationship between shared vision and creativity of teachers in middle schools.

$H_1$ : There is a significant relationship between shared vision and creativity of teachers in middle schools.

The results of this study show the correlation coefficient between the two variables is 0.272. According the results, there is a significant relationship between shared vision and creativity of teachers (Table 4). Thus  $H_0$  is rejected and research hypotheses are approved. It means that with increasing shared vision was increased creativity of teachers. These results are in good agreement with results Amani (2008) and Mohammadi (2006). The administrators and teachers have a shared vision in schools; certainly there is high creativity in works.





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#### (4): There is a significant relationship between team learning strategy and creativity of teachers in middle schools

H0: There is a not significant relationship between team learning strategy and creativity of teachers in middle schools

H1: There is a significant relationship between team learning strategy and creativity of teachers in middle schools

According the results of Pearson's test, the correlation coefficient between two variables is 0.246. Thus there is a significant relationship between team learning strategy and creativity of teachers (Table 5). Thus H<sub>0</sub> is rejected and a research hypothesis is approved. It means that with increasing team learning strategy was increased creativity of teachers. These results are in good agreement with results Amani(2008) and Mohammadi (2006).

#### (5): There is a significant relationship between systematic thinking and creativity of teachers in middle schools.

H0: There is not a significant relationship between systematic thinking and creativity of teachers in middle schools

H1: There is a significant relationship between systematic thinking and creativity of teachers in middle schools

The results of this study show the correlation coefficient between the two variables is 0.167. According the results, there is a significant relationship between systematic thinking and creativity of teachers (Table 6). Thus H<sub>0</sub> is rejected and the research hypothesis is approved. It means that with increasing systematic thinking was increased creativity of teachers. These results are in good agreement with results Amani(2008) and Mohammadi (2006).

#### Recommendations Based on the Results

Regards to this study results, the following recommendations are provided to improve organizational learning and creativity of teachers in middle school girls of Kerman:

1: According to positive and significant relationship between individual skills and creativity of teachers is recommended:

A: All the school officials try the opportunities to work with teachers to provide challenging situations

B: The schools officials are provided to the teachers fully use their skills and capabilities.

2: According to positive and significant relationship between mental skills and creativity of teachers is recommended:

A: The school officials are provided to the teachers of their ideas to solve important events in their organizations.

B: The school officials are provided to the new and better approaches to be used by teachers.

3: According to positive and significant relationship between shared vision and creativity of teachers is recommended:

A: The school officials are provided to the teachers opportunities for self-assessment on track to meet the target.

B: The school officials are provided to the teacher's common vision of how work should be done.

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**Table 1: The results of Pearson correlation test to the relationship between organizational learning and creativity teachers**

| Variable                | Creativity of Teachers          |                   |                |                      |
|-------------------------|---------------------------------|-------------------|----------------|----------------------|
|                         | Pearson correlation coefficient | Significant level | r <sup>2</sup> | Type of relationship |
| Organizational learning | 0.294                           | 0.000             | 0.087          | Direct               |

**Table 2: The results of Pearson correlation test to the relationship between individual skills and creativity teachers**

| Variable                | Creativity of teachers          |                   |                |                      |
|-------------------------|---------------------------------|-------------------|----------------|----------------------|
|                         | Pearson correlation coefficient | Significant level | r <sup>2</sup> | Type of relationship |
| Organizational learning | 0.277                           | 0.000             | 0.077          | Direct               |

**Table 3: The results of Pearson correlation test to the relationship between mental skills and creativity teachers**

| Variable                | Creativity of teachers          |               |                |                      |
|-------------------------|---------------------------------|---------------|----------------|----------------------|
|                         | Pearson correlation coefficient | Significantly | r <sup>2</sup> | Type of relationship |
| Organizational learning | 0.278                           | 0.000         | 0.052          | Direct               |

**Table 4: The results of Pearson correlation test to the relationship between shared visions and creativity teachers**

| Variable                | Creativity of teachers          |               |                |                      |
|-------------------------|---------------------------------|---------------|----------------|----------------------|
|                         | Pearson correlation coefficient | Significantly | r <sup>2</sup> | Type of relationship |
| Organizational learning | 0.272                           | 0.000         | 0.074          | Direct               |

**Table 5: The results of Pearson correlation test to the relationship between team learning strategy and creativity teachers**

| Variable                | Creativity of teachers          |                   |                |                      |
|-------------------------|---------------------------------|-------------------|----------------|----------------------|
|                         | Pearson correlation coefficient | Significant level | r <sup>2</sup> | Type of relationship |
| Organizational learning | 0.246                           | 0.000             | 0.061          | Direct               |





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**Table 6: The results of Pearson correlation test to the relationship between systematic thinking and creativity teachers**

| Variable                | Creativity of teachers          |                   |                |                      |
|-------------------------|---------------------------------|-------------------|----------------|----------------------|
|                         | Pearson correlation coefficient | Significant level | r <sup>2</sup> | Type of relationship |
| Organizational learning | 0.246                           | 0.002             | 0.028          | Direct               |





## Idiosyncratic Volatility Function in Explanation of Stock Returns

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Received: 26 Mar 2015

Revised: 23 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

This article aims to examine the relationship between stock returns and idiosyncratic risk in the three models of Capital Asset Pricing Model, Fama and French three-factor, and Carhart's four-factor; then, it compares idiosyncratic volatility function in explanation of stock returns of each model. The sample obtained using screening method consists of 118 listed companies in Tehran Stock Exchange during the years 2006 to 2012. This is a practical study in terms of objectives based on positivist theories. In terms of data collection, this is descriptive and correlation research in which data are gathered using library based methods. A multivariate linear regression model is used to test the hypotheses; panel data is used for statistical considerations. The results of test hypotheses in the study indicate that there is a significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in all three models. In addition idiosyncratic volatility function in explanation of stock returns for Carhart's four-factor model is more than other models.

**Keywords:** stock return, idiosyncratic volatility (risk unsystematic), the size, the value, the momentum.

### INTRODUCTION

Several models have been proposed to assess portfolio risk and return over the years. These models have been estimated variously; test results indicate that proposed factors in the models alone cannot solely explain the relationship between risks and return portfolio. That is why the idea of combining factors together was introduced including capital asset pricing model (CAPM), single index models and multi-factor models. Testing capital asset pricing model and single index models uncover the weakness of these models in determining expected return of securities or risk premium. From the perspectives of this model that was proposed by Sharpe (1964), Lintner (1965), Black (1972), all the risks associated with asset diversification will be removed and only systematic risk measured by



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beta is rewarding. Many studies including Black, Jensen and Scholes (1972), and Fama, and MacBeth (1973) in the past few decades support the empirical validity of the model. According to this model, when capital market is efficient and in balance, expected return of risky assets should have positive and linear relationship to assets' systemic risk as measured by market's beta, and not related to other variables. Nevertheless, available empirical evidence suggests that beta, as an indicator of systemic risk, cannot solely explain risk premium. Although most of the evidence for the relationship between rates of return and systemic risk of portfolio endorse CAPM, there is almost comprehensive evidence that can contribute to describe the performance (in addition to beta) including firm size, leverage, earnings to price ratio (E/P), and book-to-market equity ratio. Fama and French (1992) examined the common role of beta and some variables representing characteristics of a company on the average cross-sectional returns of equity in American companies. They found that from all checked variables, book-to-market equity and firm size are two factors that play a large role in explaining changes in average returns.

It is worth noting that there is evidence showing that the risk of optimal distribution of assets is not free of charge; moreover, free information and perfect will not be available. In other words, according to numerous studies on the full diversity of the portfolio, increase in systematic risk premium is justified. This encourages the researchers to pay attention to the fact that price per unit of unsystematic and idiosyncratic risk in portfolios will be similar regardless of their diversity by assuming same ultimate investor. In fact, the difference in the risk premium begins as capital and stock markets are separate and distinct (Errunza & Losq, 1985). However, the segmentation of the market can occur even in the lack of restrictions on the systematic effects and customers in the decisions by investors. Thus, the threshold of each of the two groups of individual investors and investment institutions as well as positive situations to diversify portfolios can result in inefficiency of arbitrage common factors or make a difference in their shares (Brooks, 2013). With respect to the absence of a final agreement in explaining the role of idiosyncratic volatility (unsystematic risk) in sectional return changes, this article examines the relationship between stock returns and idiosyncratic risk in the three models of Capital Asset Pricing Model, Fama and French three-factor, and Carhart's four-factor because the models have been proposed in different eras for pricing portfolio from the perspective of modern portfolio theory. Then, it examines idiosyncratic volatility function in explanation of stock returns in Carhart's four-factor model in comparison to the other tested models.

**The History of Research**

In modern investment analysis, risk sources, as factors causing volatility in returns on assets, are divided into two general groups. First, factors that affect all securities such as interest rates, inflation and exchange rate; the risk that occurs due to these factors is called systemic risk. Second group contains factors that affect only one or a few specific stock sheet; it is called unsystematic or diversifiable risk. Compared with many studies that have examined the relationship between systemic risk and return, the role of unsystematic risk in asset pricing has been overlooked significantly. Zhu and Malkil found that financial literature pays little attention to unsystematic behaviors of volatility. Of course, this lack of attention to unsystematic risk results from that CAPM of Sharpe (1964) and Lintner (1965) and Black (1972) counts only systematic risk in asset pricing. Modern portfolio theory suggests for investors to eliminate unsystematic risk through creating a portfolio of stocks. CAPM has been founded based on portfolio theory and assumes that all investors create portfolio. Thus, only systematic risks are considered in the pricing process and unsystematic risk is ignored.

**Explanatory models of risk and return****Markowitz Portfolio Model**

Markowitz (1950) presented the basic portfolio model and it is the ground for modern portfolio theory. Markowitz model tries to analyze portfolios including the number of securities. In fact, portfolio is like a balanced body providing support and opportunities for investors with respect to wide range of requirements. Portfolio analysis





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begins with information about individual securities and ends with conclusions about the overall portfolios. It is going to find portfolios that best fulfill the objectives of investor.

#### Single Index Model

William Sharp (1961) presented single index model by clarifying beta as a risk. The advantage of Sharp's single index model is simplicity and reduction of required data to select portfolio and provide a new benchmark for investment risk. The basic concept in single index model is all securities are by influenced public market volatility because same economic forces will affect most companies. Single index model assumes that all economic factors, and every related common factor, are classified in one macroeconomic index. While the index affects securities as a whole and every stock is divided into two parts, one part is macroeconomic factors and the other factor is companies' specific factors that connect return of securities to market index returns.

#### Arbitrage Pricing Theory (APT)

Arbitrage pricing theory describes the ratio of expected return on stock investment portfolios to capacity of factors affecting return. Arbitrage pricing theory is based on the assumption that stock prices are influenced by limited and non-correlated common factors as well as a completely particular independent factor. Arbitrage reasoning shows that expected return on equity in an efficient market is a linear combination of the beta factors (Morell, 2001). The main bug in Arbitrage pricing theory is that it does not offer a new subject for events and factors that affect all assets; theoretically, it is regarded s a systematic troublesome issue for determining the unique importance of each variable.

#### Capital Asset Pricing Theory (CAPM)

In capital asset pricing model, the only effective factor in return on assets is market. This model assumes that at each level of risk, one asset is more efficient than the others; it is called optimal asset. It also assumes that market is completely open. It means investors can obtain any amount of efficiency by combining existing assets. Capital asset pricing model with the above assumptions claim that the risk factors of an asset are divided into two parts. On part of the risk factors influence on all assets, it is the natural or systematic risk of the asset; this type of risk cannot be destroyed by forming portfolio. The second type of risk factors belongs to the very asset and they will be disappeared by forming portfolio because they cancel each other. They are called non-narural or unsystematic risks.

#### Fama and French Three Index Model

In 1993, Fama and French investigated the impact of factors related to company characteristics such as size, book-to-market value, leverage ... on return on equity. Based on that research, the three-index model presents the following factors to explain stock return:

1. The rate of expected return excess from the market portfolio to the risk-free rate of return (factor of market).
2. The difference between returns on portfolios consisting of stocks of small companies and portfolios consisting of stocks of small companies (Small minus Big).
3. The difference between returns on portfolios consisting of stocks of high-invested companies and portfolios consisting of stocks of low-invested companies (High minus Low). This model could well explain the changes in return; almost contrary to all known rules such as earning to price ratio (E/P) it justifies return on cash flow, sales growth and long-term return. The only inconsistency that was not explained by Fama and French three-index model is Jegadeesh and Titman's momentum strategy (1993).



**Siamak Ansari and Roya Darabi****Carhart's Four-Factor Model (The Impact of Momentum Factor on Volatility Function in Explanation Fama and French Three-Index Model)**

Jegadeesh and Titman (1993) argue that profitability of momentum strategies (meaning the purchase and maintenance of stocks with high returns and sell stocks with low efficiency) should not be attributed to systematic risk or lower reaction than stock market size to general factors. To consider the momentum factor, Carhart (1997) established risk premium associated with the momentum factor (WML); he developed the four-factor model by adding this factor to Fama and French three-index model. In the new model, momentum premium is defined as winner stock portfolio returns minus loser stock portfolio returns. Carhart (1997) states that his four-factor model reduces significantly errors in CAPM.

**Reward Beta Model**

This model is confirmed theoretically by APT model; it uses mean-risk for pricing capital assets. RB model is calculated with a series of changes in CAPM. Bern Holt (2007) presented pricing model based on replacing mean-risk to mean-variance. This method uses mean of market return, stock return and risk-free return instead of variance and covariance to obtain risk index. Risk measurement is carried out in this model based on expected utility theory by assuming risk aversion. Bern Holt (2007) states that the amount of risk considered by investors to determine beta coefficient is the mean-risk amount.

**Literature Review**

In a study titled "Idiosyncratic Volatility and Mergers and Acquisitions in Emerging Markets," Otchere et al (2014) studied the impact of unsystematic risk on the parameters profit taking. They show that there is a significant relationship between unsystematic risk and profit acquisition; this relationship appears more in economies that do not have enough information transparency.

Brooks et al (2013) conducted a study titled "Idiosyncratic volatility and the pricing of poorly-diversified portfolios". They uncover that idiosyncratic volatility cannot be priced and there is an inverse relationship between idiosyncratic volatility and diversity of portfolios so that poorly-diversified portfolios have more idiosyncratic volatility. In "Incomplete information, idiosyncratic volatility and stock returns", Tony Berrada (2012) shows the relationship between investors' information and its effect on stock return and idiosyncratic volatility. He reports the relative advantage of having more information and its impact on stock return and idiosyncratic volatility.

David Peterson (2011) studied the relationship between stock returns and the actual and expected idiosyncratic volatility; he concluded that there is a negative relationship between actual idiosyncratic volatility and stock returns and a significant positive relationship between expected idiosyncratic volatility and stock returns. In "Idiosyncratic Volatility and Expected Stock Return", Bali et al (2008) state that the relationship between variables of idiosyncratic volatility and return depends on whether data are daily or monthly in the calculation of idiosyncratic volatility. Bali et al questioned the results of Goyal and Santa-Clara (2003) and they show that their results are obtained due to small companies in the NASDAQ market and liquidity risk premium of these companies. Finally, they found no significant relationship between return on a value-based portfolios and stock variance mean-based value.

In their research "Is idiosyncratic volatility priced? Evidence from the Shanghai Stock Exchange", Drew et al (2004) used the portfolios model of French and Fama (1996) and they investigated the relationship between idiosyncratic volatility and stock returns for companies listed in Shanghai Stock Exchange during 1995 to 2000. They used of the difference between total volatility and systematic volatility to calculate idiosyncratic volatility. The results indicate that idiosyncratic volatility can be priced on the one hand and multi-factor model can estimate stock returns better than CAPM. In addition to the idiosyncratic volatility, multifactorial model contains systematic volatility and firm



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size. Barber and Odean (2000) as well as Benartzi and Thaler (2001) showed that the portfolios of individual Investors and investment funds are not diversified; both have a limited number of assets in their portfolios due to transactions costs. Therefore, both systematic volatility and idiosyncratic volatility are important and considerable for the investors.

In "On Persistence in Mutual Fund Performance", Carhart (1997) founded risk premium associated with the momentum factor (WML) to consider the momentum factor, and developed the four-factor model by adding this factor to fama and french three-index model in which momentum premium is defined as winner stock portfolio returns minus loser stock portfolio returns. In comparison with Fama and French's three-factor model, Carhart's four-factor model could reduce pricing average error of portfolio sorted by one-year delay returns. In articles titled "The Cross-Section of Expected Stock Returns" and "Common risk factors in the returns on stocks and bonds", Fama and French (1992-93) investigated the relationship between the variables of beta, size, ratio of book value to market value, financial leverage, and earnings to price ratio with the expected return on the equity in the capital markets of America. They concluded that the systematic risk (beta) is not able to explain all differences in stock returns during the study period (1963-1990). Among the variables, the two variables of book value ratio to market value and size of the company can describe the difference in stock returns averages.

The studies conducted by Markowitz (1952), Sharp (1964) and Lintner (1965) are grounds for modern portfolio theory; the theory divides total risk to systematic volatility and idiosyncratic volatility. These first studies believed that idiosyncratic volatility has no role in stock prices under the CAPM because the investors maintain market portfolio. Fama and MacBeth (1973) showed that there is no risk premium associated with idiosyncratic volatility.

**Research Hypotheses**

Given the importance of the variables associated with investors' decision to the maximize returns and minimize volatility of the established portfolio ans with respect to tests of idiosyncratic volatility function in explaining stock returns from the perspectives of three models of Capital Asset Pricing Model, Fama and French three-factor, and Carhart's four-factor, the research hypotheses will be as follows:

1. First hypothesis: There is a significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in Capital Asset Pricing Model.
2. Second hypothesis: There is a significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in Fama and French three-factor model.
3. Third hypothesis: There is a significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in Carhart's four-factor model.
4. Fourth hypothesis: Function in explaining stock returns by idiosyncratic volatility in Carhart's four-factor is more than other models.

**MATERIALS AND METHODS**

Since this article takes a step to improve and to perfect methods, tools, structures and patterns practical knowledge on subject through the results of basic researches, it is a practical research in terms of objective and is included in the realm of positivist theories. In terms of data collection, this is descriptive because it cannot manipulate the data. With respect to the analysis of the relationship between variables based according to research objective, this is a correlation analysis on the one hand. On the other hand, it is a survey since it evaluates data to make decision about the study. The library based methods are used in this research including library resources and internal and external databases as well as scientific articles to gather information required for the literature. In order to collect data, the researcher uses Stock Exchange Database, The database of Research, Development and Islamic Studies Management of Stock Exchange (rdis.ir), the website of Tehran Securities Exchange Technology Management company (tsetmc.com), codal







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website (codal.ir), the databases of Tadbir Pardaz software and Rah Avard Novin software, and weekly reports and financial statements as the case.

#### Statistical Population and the Research Statistical Sample

This research was carried out on the listed companies in Tehran Stock Exchange during 2006-2012 the criteria were having the same qualifications, the financial year end is 20 March, non-negativity book value of equity for the year t-1, lack of inclusion of leasing, investment and banking companies, and the trading of more than 6 months.

#### Research Variables

Given the fundamental questions and proposed hypotheses indicating the relationship between stock returns and idiosyncratic volatility (unsystematic risk) from the perspectives of three models of CAPM, Fama and French and Carhart as well as proposed hypotheses about their analysis, research variables are as follows:

##### Independent variable

Idiosyncratic volatility (unsystematic risk) is an independent variable in this study and it is shown by  $(Vol_{it})$ . Idiosyncratic volatility (unsystematic risk) is a part of total risk that is controllable only for a company or industry with diversification of portfolio. It is equivalent to the remnants of the market model using monthly data during a financial year.

##### Dependent variable

Premium stock return is a dependent variable shown by  $(R_{it} - R_{ft})$ . It is a collection of income granted to stock during a fiscal period in various ways including price change, dividends per share, benefit from priority to buy the shares and benefits resulting from stock dividends or bonus shares. Premium stock returns resulting from actual stock return minus risk-free return. Premium stock return is calculated in this formula:

$$R_{it} = \frac{(1 + x + y)P_{it} - P_{it-1} - yP_{ni} + DPS}{P_{it-1} + yP_{ni}}$$

$R_f$  = The rate of on-account interest of bonds

##### Control Variable

This study uses four control variables as follows:

- 1. Size (SMB):** The difference between the average of returns on two portfolios of small market value and big market value in the period (t) that is equivalent to the difference between average of returns on small companies' portfolio and big companies' portfolio.
- 2. Value (HML):** The difference between the average of returns on two portfolios of high value market and low value market in the period (t) that is equivalent to the difference between average of returns on high value market's portfolio and low value market's portfolio.
- 3. Premium stock return (market)  $(R_{mt} - R_{ft})$ :** it is the rate of excess portfolio return to the risk-free rate of return. Stock return ( $r_{mt}$ ) is calculated using Tehran Stock Exchange price index and dividend (TEDPIX) as follows:

$$r_{mt} = \frac{TEDPIX_t - TEDPIX_{t-1}}{TEDPIX_{t-1}}$$





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**4. Momentum factor (UMD):** returns on portfolios consisting of stocks of high-invested companies minus portfolios consisting of stocks of low-invested companies that is equivalent to the difference between returns on portfolios consisting of stocks of high-invested companies and portfolios consisting of stocks of low-invested companies.

**The Analysis of Data, Testing Hypotheses and Research Variables**

In order to examine the mentioned hypotheses, multivariate linear regression model should be used. Moreover, panel data is used for statistical purposes. Model (1) is used to evaluate first hypothesis. In this model, the coefficient of coefficient  $\beta_2$  at confidence level of 95% is significant. Then, first research hypothesis will be confirmed.

$$(r_{it} - r_{ft}) = \alpha_{it} + \beta_1(r_{mt} - r_{ft}) + \beta_2IVol_{it} + \varepsilon_{it} \tag{1}$$

In this model,

$r_{it}$  = actual returns of stock i in the year t, which is calculated as follows:

$$R_{it} = \frac{(1 + x + y)P_{it} - P_{it-1} - yP_{ni} + DPS}{P_{it-1} + yP_{ni}}$$

Where

$P_{it}$  = the price of stock i at the end of year t.

$P_{it-1}$  = the price of stock i at the beginning of year t.

$P_{ni}$  = Par value of stock of company i.

$x$  = Percent of capital increase from reserves.

$y$  = Percent of capital increase from demand and brought cash.

$DPS$  = Dividend per share.

$r_{ft}$  = Risk-free return that is obtained according to available literature about on-account interest of bonds during the study.

$r_{mt} - r_{ft}$  = the factor of market or premium market risk that is defined as the ratio of excess portfolio return to risk-free return. In this regard, market return ( $r_{mt}$ ) is calculated using Tehran Stock Exchange price index and dividend (TEDPIX) as follows:

$$r_{mt} = \frac{TEDPIX_t - TEDPIX_{t-1}}{TEDPIX_{t-1}}$$

$IVol_{it}$  = Idiosyncratic volatility that is equal to the remainings of market model estimation using monthly data during a financial year.

Model (2) is used to evaluate second hypothesis. In this model, the coefficient of coefficient  $\beta_4$  at confidence level of 95% is significant. Then, second research hypothesis will be confirmed.

$$(r_{it} - r_{ft}) = \alpha_{it} + \beta_1(r_{mt} - r_{ft}) + \beta_2SMB_{it} + \beta_3HML_{it} + \beta_4IVol_{it} + \varepsilon_{it} \tag{2}$$

Where

$SMB_{it}$  = the factor of size that is equivalent to the difference between mean of returns on portfolios consisting of stocks of small companies and mean of portfolios consisting of stocks of small companies.

$HML_{it}$  = the factor of value that is equivalent to the difference between the mean of returns on portfolios of companies with high book value and the mean of returns on portfolios consisting of stocks of low-invested companies.

$HML_{it}$  = the factor of value that is equivalent to the difference between the mean of returns on portfolio of companies with high market value and companies with low market value.

Other variables are the same as Model (1).





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Model (3) is used to evaluate third hypothesis. In this model, the coefficient of coefficient  $\beta_5$  at confidence level of 95% is significant. Then, third research hypothesis will be confirmed.

$$(r_{it} - r_{ft}) = \alpha_{it} + \beta_1(r_{mt} - r_{ft}) + \beta_2SMB_{it} + \beta_3HML_{it} + \beta_4UMD_{it} + \beta_5IVol_{it} + \varepsilon_{it} \quad (3)$$

Where

$UMD_{it}$  = the momentum factor that is equivalent to the difference between the mean of the mean of returns on portfolio of high efficient companies and portfolios of low efficient companies.

Other variables are the same as Model (1).

Determination coefficients of Models one to three have been compared to test the fourth hypothesis. If the determination coefficient of Carhart's model is higher than other models, this hypothesis will be confirmed.

#### The results of Testing the First Hypothesis

Model (1) is used to test this hypothesis; it is a regression model estimated using panel data method:

$$(r_{it} - r_{ft}) = \alpha_{it} + \beta_1(r_{mt} - r_{ft}) + \beta_2IVol_{it} + \varepsilon_{it} \quad (1)$$

According to the results presented in Table 4, Significant level (P-Value) of t-statistics for idiosyncratic volatility is lower than 0.05 (0.0000) and its coefficient is positive (2.9491). Thus, one can say with 95% confidence that there is a direct and significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in Capital Asset Pricing Model. Therefore, the first hypothesis is confirmed at the significance level of 95 percent.

#### The results of Testing the Second Hypothesis

Model (2) is used to test this hypothesis; it is a regression model estimated using panel data method:

$$(r_{it} - r_{ft}) = \alpha_{it} + \beta_1(r_{mt} - r_{ft}) + \beta_2SMB_{it} + \beta_3HML_{it} + \beta_4IVol_{it} + \varepsilon_{it} \quad (2)$$

According to the results presented in Table 5, Significant level (P-Value) of t-statistics for idiosyncratic volatility is lower than 0.05 (0.0000) and its coefficient is positive (2.8283). Thus, one can say with 95% confidence that there is a significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in Fama and French three-factor model. Therefore, the second hypothesis is confirmed at the significance level of 95 percent.

#### The results of Testing the Third Hypothesis

Model (3) is used to test this hypothesis; it is a regression model estimated using panel data method:

$$(r_{it} - r_{ft}) = \alpha_{it} + \beta_1(r_{mt} - r_{ft}) + \beta_2SMB_{it} + \beta_3HML_{it} + \beta_4UMD_{it} + \beta_5IVol_{it} + \varepsilon_{it} \quad (3)$$

According to the results presented in Table 6, Significant level (P-Value) of t-statistics for idiosyncratic volatility is lower than 0.05 (0.0000) and its coefficient is positive (2.7750). Thus, one can say with 95% confidence that there is a significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in Carhart's four-factor model. Therefore, the third hypothesis is confirmed at the significance level of 95 percent.

#### The results of Testing the Fourth Hypothesis

Determination coefficients of Models one to three have been compared to test the fourth hypothesis. If the determination coefficient of Carhart's model is higher than other models, this hypothesis will be confirmed. The results of determination coefficients for each model is shown in Table 7. According to Table 7, Carhart's four-factor model has the highest idiosyncratic volatility function in explanation of stock returns. Thus, the fourth hypothesis is confirmed at the significance level of 95 percent and one can say that function in explaining stock returns by idiosyncratic volatility in Carhart's four-factor is more than other models. In terms of Fama and French three-factor



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model and Capital asset pricing model, it is worth noting that Fama and French three-factor model has higher function in explaining stock return.

**DISCUSSION AND CONCLUSION**

Strict enforcement of statistical tests showed that there is a significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in the three models of Capital Asset Pricing Model, Fama and French three-factor, and Carhart's four-factor. The results of this research on all the three models indicate that Fama and French three-factor model has better idiosyncratic volatility function in explanation of stock returns rather than Capital Asset Pricing Model. In addition, by creation of a new model by adding momentum factor to Fama and French three-factor model (Carhart's four-factor model), the function in explanation of the pattern will be increased. However, the result can enhance recognition and knowledge of investors and researchers capital market and shed the light on other factors that may have function in explaining return volatility.

The reasons for obtaining opposite results in conducted researches abroad Iran may be as follows:

1. High inflation in the Iranian market and lack of revaluation of assets. Inflation in Iran (for the study period) is not comparable with Western countries where foreign investigations have conducted their researches. Due to tax issues in Iran capital market, private companies are not willing to reevaluate their assets and the amount of book value is lower than the actual amount; therefore, the ratio of book value to market value (BV/MV) is getting smaller. Hence, risk is not the only reason for getting smaller. Inflation and lack of revaluation of assets are reasons for this willingness to get smaller in statistical population.
2. Lack of information transparency. Investment information is not presented timely in Iran capital market and the influencing events on the level of company's stock price are not reflected timely.
3. Historical presentation of financial statements of companies.
4. The absence of unrealistic profit due to inflation in business units.
5. In the conducted studies abroad, statistical populations are several times greater because of the extent of the capital market.

**Research Recommendations**

The results show that there is a significant relationship between stock returns and idiosyncratic volatility (unsystematic risk) in the three volatility models of modern portfolio theory including Capital Asset Pricing Model, Fama and French three-factor, and Carhart's four-factor. Although Capital Asset Pricing Model is a basic model in modern portfolio theory that introduces only systematic risk as effective factor in stock returns, the significant relationship between stock returns and idiosyncratic volatility in the Fama and French three-factor, and Carhart's four-factor models suggest for financial investors and researchers to pay attention to idiosyncratic volatility as an important factor in their decisions as well as considering the impact of these patterns on stock returns.

As noted, total investment risk is divided into two groups: systematic risk and idiosyncratic volatility (unsystematic risk). Since idiosyncratic volatility is limited to a company or industry, investors can reduce a part of total risk by establishing a diversified portfolio. The more diversified are bonds, the smaller will be idiosyncratic volatility and total risk will be closer to systematic risk. Therefore, diversification of bonds cannot reduce systematic risk; in other words, total risk of portfolio cannot be reduced more than total risk of market portfolio. In addition, with respect to inflation in Iran, it is recommended that the financial statements are prepared in accordance with inflation conditions; consequently, they will be closer to liquid values. Hence, book value ratio to market value (BV/MV) will also be closer to the actual amount. Finally, due to the increasing tendency of small investors to invest in stock market and in order to propel the liquidity from the community to the production cycle, it is suggested for Securities





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and Exchange Organization to establish an easy mechanism for to trading shares of companies and to encourage small investors to invest in shares of companies.

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**Table 1: The process of sample selection**

| Description   | Number | Percent |
|---|--------|---------|
| The total number of listed companies on Tehran Stock Exchange at the end of 1391  | 471    | 100     |
| Benchmarks:   |        |         |
| The number of companies that have not been active in the stock market in the period 1385 to 1391.                         | 146    | 31      |
| The number of companies that have been adopted since the year 1385 in the Tehran Stock Exchange.                          | 39     | 8       |
| The number of companies that are part of the holding, investment, financial intermediation, banks or leasing.             | 40     | 8.5     |
| The number of companies that change the fiscal year in the period 1385 to 1391 and the fiscal year in not ended in March. | 65     | 14      |
| The number of companies that have more than 6 month delay in their shares   | 63     | 13      |





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|  |     |    |
|--|-----|----|
| traded during 1385 to 1391.  |     |    |
| The number of companies in the period 1385 to 1391 whose data are not available. | -   | 0  |
| The total number of companies in the sample                                      | 118 | 25 |

**Table 2. Descriptive statistics of research variables**

| Variable        | Observation | Mean   | Standard deviation | Minimum | Maximum | Skewness | Elongation |
|-----------------|-------------|--------|--------------------|---------|---------|----------|------------|
| $(R_i - R_f)$   | 818         | 13.151 | 69.133             | -95.02  | 501.35  | 2.866    | 15.619     |
| $(R_{m} - R_f)$ | 818         | 15.033 | 31.558             | -29.229 | 68.813  | 0.371    | 1.965      |
| $(SMB_t)$       | 818         | 10.146 | 5.659              | 0.545   | 17.418  | -0.194   | 1.981      |
| $(HML_t)$       | 818         | 23.434 | 12.420             | 10.053  | 48.540  | 0.964    | 2.715      |
| $(UMD_t)$       | 818         | 35.022 | 6.670              | 26.915  | 49.671  | 1.214    | 3.640      |
| $(IVol_t)$      | 818         | 11.283 | 8.143              | 0.499   | 67.417  | 2.595    | 13.121     |

Skewness and elongation for stock return premium indicate that this variable has not a normal distribution.

**Table 3: Correlation matrix between the variables**

|                    | $(R_i - R_f)$ | $(R_m - R_f)$ | $(SMB_t)$ | $(HML_t)$ | $(UMD_t)$ | $(IVol_t)$ |
|--------------------|---------------|---------------|-----------|-----------|-----------|------------|
| <b>Correlation</b> |               |               |           |           |           |            |
| <b>Probability</b> |               |               |           |           |           |            |
| $(R_i - R_f)$      | 1             |               |           |           |           |            |
|                    |               |               |           |           |           |            |
| $(R_m - R_f)$      | 0.226         | 1             |           |           |           |            |
|                    | 0.000         |               |           |           |           |            |
| $(SMB_t)$          | 0.179         | 0.143         | 1         |           |           |            |
|                    | 0.000         | 0.000         |           |           |           |            |
| $(HML_t)$          | 0.202         | 0.183         | 0.750     | 1         |           |            |
|                    | 0.000         | 0.000         | 0.000     |           |           |            |
| $(UMD_t)$          | 0.167         | -0.020        | 0.479     | 0.834     | 1         |            |
|                    | 0.000         | 0.554         | 0.000     | 0.000     |           |            |
| $(IVol_t)$         | 0.357         | 0.049         | 0.084     | 0.149     | 0.192     | 1          |
|                    | 0.000         | 0.153         | 0.015     | 0.000     | 0.000     |            |





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**Table 4: Results of estimating Model (1)**

| Dependent variable: stock returns premium<br>Number of observations: 818 years - Company |             |                         |         |       |
|--|-------------|-------------------------|---------|-------|
| Variable   | Coefficient | t-statistics            | P-Value | VIF   |
| Constant coefficient   | -27.023     | -4.842                  | 0.0000  | -     |
| premium of market performance  | 0.4587      | 7.224                   | 0.0000  | 1.002 |
| Idiosyncratic volatility   | 2.9491      | 5.014                   | 0.0000  | 1.002 |
| Determining factor model=0.1718  |             |                         |         |       |
| (F) Model statistics   | 7.003       | Statistic (Jarque-Bera) | 531.84  |       |
| (P-Value)  | 0.0301      | (P-Value)               | 0.0000  |       |
| (Breusch-Pagan) statistics   | 1.939       | Watson-Durbin Statistic | 539.79  |       |
| (P-Value)  |             |                         | 0.0000  |       |

**Table 5: Results of estimating Model (2)**

| Dependent variable: stock returns premium<br>Number of observations: 818 years - Company |             |                         |         |        |
|--|-------------|-------------------------|---------|--------|
| Variable   | Coefficient | t-statistics            | P-Value | VIF    |
| Constant coefficient   | -42.5079    | -7.699                  | -       | 0.0000 |
| premium of market performance  | 0.4119      | 5.761                   | 1.035   | 0.0000 |
| Size   | 1.0168      | 1.713                   | 2.293   | 0.0870 |
| VAlue  | 0.3086      | 1.125                   | 2.358   | 0.2607 |
| Idiosyncratic volatility   | 2.8283      | 10.257                  | 1.025   | 0.0000 |
| Determining factor model=0.1880  |             |                         |         |        |
| (F) Model statistics   | 47.072      | Statistic (Jarque-Bera) | 7.919   |        |
| (P-Value)  | 0.0000      | (P-Value)               | 0.0190  |        |
| (Breusch-Pagan) statistics   | 41.013      | Watson-Durbin Statistic | 1.9444  |        |
| (P-Value)  | 0.0000      |                         |         |        |







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**Table 6: Results of estimating Model (3)**

| Dependent variable: stock returns premium<br>Number of observations: 818 years - Company |                  |                                      |                 |        |
|--|------------------|--------------------------------------|-----------------|--------|
| Variable   | Coefficient      | t-statistics                         | P-Value         | VIF    |
| Constant coefficient   | -67.9858         | -3.657                               | 0.0003          | -      |
| premium of market performance  | 0.4505           | 5.901                                | 0.0000          | 1.181  |
| Size   | 1.4126           | 2.160                                | 0.0311          | 2.789  |
| Value  | -0.2956          | -0.588                               | 0.5563          | 7.9222 |
| Momentum factor  | 1.0177           | 1.435                                | 0.1515          | 4.553  |
| Idiosyncratic volatility   | 1.177            | 9.980                                | 0.0000          | 1.043  |
| Determining factor model=0.1880  |                  |                                      |                 |        |
| (F) Model statistics<br>(P-Value)  | 38.134<br>0.0000 | Statistic (Jarque-Bera)<br>(P-Value) | 8.184<br>0.0167 |        |
| (Breusch-Pagan) statistics<br>(P-Value)  | 330.16<br>0.0000 | Watson-Durbin Statistic              | 1.945           |        |

**Table 7: the comparison of functions in explaining for Models (1), (2), and (3)**

| Model                              | Determination coefficients |
|------------------------------------|----------------------------|
| Capital asset pricing model        | 0.1718                     |
| Fama and French three-factor model | 0.1880                     |
| Carhart's four-factor model        | 0.1901                     |





## Investigating the Relationship between Islamic Ethics, Intrinsic Motivation, Job Satisfaction, Organization Commitment, and Job Performance in Banks (case Study: State Banks in Yazd Province)

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Received: 25 Mar 2015

Revised: 17 Apr 2015

Accepted: 29 May 2015

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### ABSTRACT

The aim of the present study is to investigate the relationship between Islamic ethics, intrinsic motivation, job satisfaction, organization commitment, and job performance. Therefore in terms of the goal, it is an applied research using descriptive-correlative method, in which data has been collected via survey method through questionnaires. The research population consists of the employees of state banks, and random sampling has been used to select the sample. Data analysis was carried out using structural equations and AMOS Software. Findings show that Islamic ethics has significant positive relationship with job satisfaction, job performance, intrinsic motivation, and organization commitment; also that intrinsic motivation and job satisfaction have significant positive relationships with organization commitment.

**Keywords:** Islamic work ethics, intrinsic motivation, organization commitment, job satisfaction, job performances.

### INTRODUCTION

Human force is so significant to the organization that the employees are called internal customers. It is obvious that attracting external customers' satisfaction is very difficult, if not impossible, unless internal customers are satisfied with their performance. If the employees do not have organization attachment, and do not use their skills and abilities, the organization cannot accomplish its goals. Apparently all software, hardware, and advanced technologies



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are just tools which can be efficiently used only if having trained human force interested in and committed to the organization. Optimum utilization of the employees' abilities is among the most important goals of every organization to fulfill which, establishing justice, commitment and satisfaction among the employees is of great significance (Edris and Erdly, 2005). After the failure of huge companies such as Enron and the crises in the West, the study of work ethics has attracted significant interest during the recent years (Yousef, 2001). This can reflect the belief that work ethics improves the employees' attitudes towards their job and organization. Work ethics, which is usually related with the employee's religious believes, is supposed to be related to organization commitment, job satisfaction, and other individual and organizational variables. The studies conducted on the relationships between these variables are focused on two types of work ethics; the ethical policies employed by the organization, and non-official ethical expectations (Rahman, 2006). Previous studies have investigated Islamic work ethics and its effects on job satisfaction and organization commitment (Yousef, 2001; Rokhman and Omar, 2008). The present study has extended Islamic ethics by investigating its relationships with intrinsic motivation, job satisfaction, organization commitment, and job performance.

**Theoretical Concepts and Research Background****Islamic work ethics**

Work ethics is a cultural norm giving a positive spiritual value to performance of good deeds in the society. It is based on the belief that working has itself got an intrinsic value (Cherington, 1980). Islam has regarded working as precious and important as praying, which gives it special value and status. According to Islam Work ethics, life is senseless without work, and those who work hard are more successful. Ethics is defined as a system of values, believes, principles, does, and don'ts upon which good deeds and bad deeds of the organization are determined and distinguished from each other (Alvani and Rahmati, 2009). Islamic work ethics is also defined as a set of moral and spiritual principles distinguishing the right from the wrong (Abdollahi and Nejat, 1390). It regards the inclination towards work as a privilege in human life (Haroon et al., 2012). Sufficient efforts must be made within the work environment. "Man does not accomplish but what he has attempted for." Islamic work ethics stresses on cooperation and consult. "Do consult with them in your decisions" and "They carry out their tasks through consult". It regards consult as a way to avoid possible errors (Yousef, 2000; Alkazemi, 2007). Social relationships have been encouraged in work in order to meet individuals' needs and establish a balance in their individual and social life (Nasr, 2009). Furthermore, work is regarded as the origin of independence and as a tool for developing individual perfection, self-esteem, satisfaction, and self-flourishing (Yousef, 2000). Islamic work ethics consider creative work as a source of happiness and perfection. It also regards hardworking as a privilege and believes that those who work hard are more likely to succeed in their lives; on the other hand, those who do not work hard will not be successful (Ali, 1988). The value of work in Islam is upon the intentions rather than the consequences (Rizk, 2008).

**Intrinsic motivation**

Motivation is a multidimensional psychological process leading individuals' behaviors towards optimal goals (Ryan and Deci, 2000). Motivation is the main cause of behavior whether being created by the conditions in the environment or being implied based on personal reports. Motivation can be defined as the driving factor of behavior (Gage & Berliner, 1984). In simple words, motivation makes the individual step forth and determines where he goes. Therefore, it is the producer of behavior, determiner of the force, and the goal of the behavior (Gagne, 2001).

**Organization commitment**

Another effective factor in organizations is the members' organization commitment. Since it has a significant impact on productivity and profitability (Shakerinia and Nabavi, 2011), it has been the focus of organizational studies within the recent years. Previous studies have shown that not only organization commitment in workforce is an effective factor of organization successfulness but also it seems to have an intercultural credit (Soaer, Bae, SeongHyon, 1996).



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Organization commitment is kind of job attitude and refers to the situations in which the member regards the organization's goals as identifying him and wishes to stay in that organization; hence, he tries his best to realize the organizational goals (Robins; translated by Parsaeian, 2000).

Commitment means taking the responsibility of something or undergoing a promise. It refers to:

1. Getting committed to a belief
2. Referring to a subject
3. Undergoing a future task
4. The state of emotional necessity to carry out a duty (Porteret al, 1974)

**Job satisfaction**

Job satisfaction is another commonly used concept in organization psychology which has largely been studied. In this regard, Shokrkon, Na'ami, Nisy, and Mehrbizadeh Honarmand (2002) stated that there is no other concept in organization and industrial psychology with the great background as job satisfaction. Job satisfaction is said to be the individual's general attitude towards his job. Individuals with high levels of satisfaction have positive attitudes towards their jobs; on the other hand, individuals who are dissatisfied with their jobs have negative attitudes towards their jobs (Simoens, Scott & Sibbald, 2002). Job satisfaction increases the individual's productivity, makes him committed to the organization, guarantees the individual's physical and mental health, improves his spirit, makes the individual satisfied with life, and makes him learn new job skills more quickly. It refers to positive and pleasing feelings an individual experiences through assessing his job (Moghimi, 2007). Job satisfaction refers to the degree of individuals' positive feelings and attitudes towards their job. When an individual expresses his satisfaction with his job, this means that he really loves his job, has good feelings concerning his job, and that his job is important to him (Moghimi, 2001). Job satisfaction is one of the most important components of individuals' attitudes, and is very significant due to its numerous effects.

**Job performance**

Various perspectives have been presented regarding job performance. In fact it refers to a set of behaviors individuals show in respect with their job (Rashidpour, 2000). Job performance is said to be individuals' output according to the tasks appointed to them which implies the employee's effort and success in carrying out his duties and the anticipated behaviors (Baboo et al., 2002). It can also be said to be the manner and extent of performing the duties assigned by the experts (Alviani and Memarzadeh, 1995).

**Research Background**

The first studies regarding work ethics were emphasized on Protestant work ethics supported by Max Weber (Yousef, 2000). Thereafter, Ali (1988) designed the framework of Islamic work ethics which was later used by the researchers. Through some studies concerning the relationships between Islamic work ethics and employees' attitudes towards organizational changes and organization commitment, Yousef realized that Islamic work ethics positively affects the employees' attitudes towards organizational changes and organization commitment. Also in 2001, he studied the mediator role of Islamic ethics in the relationships between organization commitment and job satisfaction among Muslim employees in several companies in UAE. He found that Islamic work ethics affects both organization commitment and job satisfaction. In a case study, Rahman et al. (2006) investigated the relationship between Islamic work ethics and organization commitment among 227 employees in local banks in Malaysia. Ali and Alkazemi (2007) investigated the relationship between Islamic work ethics and loyalty in Kuwait and found the significant correlation between these variables. Among the studies concerning the relationship between work ethics and job satisfaction, Yousef (2001), Ku and Bu (2001), and Witel and Davis (1990) state that work ethics is strongly related with job satisfaction (Wahibur, 2010).



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In the United States, Alkinz (2001) found a weak correlation between work ethics and job satisfaction in a Japanese productive company. In a study in the Middle East, Ambert and Hogan (2009) realized that work ethics has the most effect on job satisfaction (Mohammed et al., 2010). Studies by Week et al. (2004) and Schwepker (2001) demonstrated that in the workplace, work ethics affects job satisfaction and organization commitment. Peterson (2003) found a significant relationship between lack of work ethics and low organization commitment and high tendency to leave the organization. Yousef (2001) showed that those who care for Islamic work ethics are more satisfied with their jobs and therefore, represent higher commitment. Schwepker (2001) found a significant dependence between positive ethics and job satisfaction as an inseparable component. Findings concerning the relationship between job satisfaction and organization commitment are mixed up. For example, Lurie et al. (1986) found nothing to support the relationship between job satisfaction and organization commitment. Peterson et al. (2003) found no witness confirming the relationship between these two variables. Alpander (1990) found a strong positive correlation between job satisfaction and organization commitment. In Greek organizations, Markowitz et al. (2007) confirmed the relationship between effective organization commitment and internal and external job satisfaction.

Testa and Mark (2005) state that there is a controversial relationship between job satisfaction and organization commitment, and point out that Kezaliski (1988), Kaspi and Lazar (1991), and Matthew Zajac (1990) have also interpreted this relationship. Haroun et al. also conducted a study under the title of "The Relationship between Islamic Work Ethics and Job Satisfaction in Health Sector in Pakistan" among 80 nurses of private hospitals and showed that there is a significant positive relationship between Islamic work ethics and job satisfaction among the employees. Having studied the effect of Islamic work ethics on job performance (job satisfaction, tendency to leave the organization and organization commitment) in Indonesia, Rokhman et al. observed that Islamic work ethics has positive effects on both organization commitment and job satisfaction but does not affect the tendency to leave organization.

Yousef investigated the mediator role of organization commitment in the relationship between Islamic work ethics and the attitudes towards changes, and realized that Islamic work ethics positively affects various aspects of organization commitment and attitudes towards organizational changes. In a study under the title of "Values and Work Ethics" conducted among the teachers in Rasht, Abdullahi and Nejat (2012) concluded that work ethics is at a high level among the teachers; also that work ethics is significantly related with religious, cultural, political and economical values. Sanagoo, NikRavesh, and Dabaghi (2007), Jahangir, Pazargadi, Mahfouzpour, and Akbarzadeh (2008), Hosseinian, Majidi, and Habibi (2008), Barooni (2008), RahmanSeresht and Fayazi (2009), and Khosravizadeh, Khalaji, and Khajavi (2009) have also studied organization commitment and its role in representing positive behaviors resulting in realization of organizational goals.

Amoozadeh (2008) states that employees have high organization commitment and this commitment is emotional. Although their job satisfaction is, in general, above the average, they are not well satisfied with their salary, rewards and regulations. Zaki (2004) classifies the findings of studies related to his research in four categories: Studies which consider organization commitment as affected by job satisfaction (Williams and Harz, 1986; March and Manvy, 1977); studies which consider job satisfaction as affected by organization commitment (Batman and Strezer, 1984; Wendenberg, Lans, 1992); studies which confirm a correlation between these two variables (Porter, 1974; Farks and Tetris, 1989; and Lans, 1991); and studies which observe no relationship between these two variables (Kari Etal, 1986). He observes a significant relationship between these two variables.

## METHODOLOGY

The present research is an applied study with correlation approach. In terms of method, it is a descriptive-survey study. With regards to what mentioned under the title of theoretical concepts, the following hypotheses were composed which will later be examined.



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- H1: there is a significant positive relationship between Islamic work ethics and intrinsic motivation.  
H2: there is a significant positive relationship between intrinsic motivation and job satisfaction.  
H3: there is a significant positive relationship between intrinsic motivation and organization commitment.  
H4: there is a significant positive relationship between intrinsic motivation and job performance.  
H5: there is a significant positive relationship between Islamic work ethics and job satisfaction.  
H6: there is a significant positive relationship between job satisfaction and organization commitment.  
H7: there is a significant positive relationship between job satisfaction and job performance.  
H8: there is a significant positive relationship between Islamic work ethics and organization commitment.  
H9: there is a significant positive relationship between Islamic work ethics and job performance.

The research population consists of the employees of the state banks in Yazd Province. The sample was selected using random sampling.

**Research Tools**

The employed tool in this research was a questionnaire extracted from English papers and the reference questionnaire in international studies designed based on Lickert. The spectrum in this questionnaire was composed of 5 sections. The questionnaire was composed of 76 questions containing: Islamic work ethics (17 questions), intrinsic motivations (3 questions), job satisfaction (21 questions), organization commitment (20 questions), and job performance (15 questions). Questionnaires were distributed and collected through the researcher's physical attendance in respondents' work place. After translating the questionnaire, the researcher confirmed its validity through expertise poll.

**Data Analysis****Confirmatory Factor Analysis**

KMO coefficient was used in order for confirmatory factor analysis and identification of research components. By fulfilling the first goal of factor analysis, it determines whether or not the variance of research variables is affected by the shared variance of certain hidden and basic variables. The value of this statistic fluctuates between 0 and 1. Three ranges can be defined for its fluctuations:

1. Values below 0.49: factor analysis is not recommended; rather, data appropriateness must be increased by key modifications.
2. 0.5 to 0.69: factor analysis is fairly appropriate.
3. Above 0.7: factor analysis is recommended.

**Bartlett's sphericity test**

This test tries to fulfill the second goal of factor analysis; this helps us obtain a new structure based on the correlation between the variables and factors and their implied meanings after the data was minimized to a set of hidden factors. This examines the null hypothesis whether or not the data correlation matrix is a unit (identity) matrix. If the matrix between the variables is a unit (identity) matrix, the variables do not have significant relationships with each other and it is not possible to define new factors based on the correlation between the variables. Therefore, when the value of Bartlett Test with reliability of 95% is smaller than 0.05, there is no significant relationship between the variables, and it is not possible to obtain a new structure of the data. As it can be observed, the value of KMO for all the variables is greater than 0.6 showing the possibility of minimizing the data corresponding to these variables into these variables. Also since the significance is smaller than 0.05, we can conclude that the matrix of correlation between the variables is not the unit (identity) matrix. This means that there is strong correlation between the internal signs of every factor. On the other hand, no correlation is observed between the signs of a factor and those of another one.





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After confirming the considered component, we should select the signs with significant factor load. The most common rule in this regard is that only variables with a factor load of greater than 0.4 must be considered. Ford et al. and Rommel believe that while interpreting the results of factor load, particular attention should be paid to the highest and lowest loads as well as the signs between the loads. According to some sources, the minimum acceptable load for a variable can be 0.32. The factor load of 0.32 indicates acceptable significance; 0.4 denotes a higher level of significance, and 0.5 implies very acceptable significance.

As the above table shows, the factor load for most of the signs is greater than 0.32, therefore being acceptable. Only in respect with q21 of job satisfaction, and q48 and q56 of organization commitment, since the factor load is smaller than 0.32, the signs will be eliminated from the questionnaire. This increase the validity of the questionnaire, and lets structural equations be conducted for the signs with a factor load greater than 0.32 only.

#### Structural equations model for optional examination of the hypotheses

Path analysis technique is used in order to examine the research hypotheses. In this manner, the model is firstly assessed with the predetermined variables, and the hypotheses are either confirmed or rejected. Then the model is presented with confirmed hypotheses only. Finally, the presented model is explained on the base of the measures of appropriateness.

The above table represents all the paths in the model. As it presents, the coefficient of regression for all the paths is examined. If the level of significance is smaller than 0.05 with a reliability of 95%, the corresponding null hypothesis is rejected. Rejection of null hypothesis shows the effectiveness of the corresponding path. The amount of this effect can be found in the column under standard estimation. This shows the strength of the path. A negative value of standard estimation (-) shows the reverse effect of response variable from independent variable (negative effect). With regards to what already mentioned, the hypothesis concerning with the effect of intrinsic motivation on job satisfaction, the one concerning with the effect of intrinsic motivation on job performance, and the one concerning with the effect of job satisfaction on job performance were rejected; and it was concluded that intrinsic motivation has negative effect on organization commitment.

The results of examining the hypotheses are as follows:

H1: there is a significant positive relationship between Islamic work ethics and intrinsic motivation (Confirmed).

H2: there is a significant positive relationship between intrinsic motivation and job satisfaction (Rejected).

H3: there is a significant positive relationship between intrinsic motivation and organization commitment (Negative Effect).

H4: there is a significant positive relationship between intrinsic motivation and job performance (Rejected).

H5: there is a significant positive relationship between Islamic work ethics and job satisfaction (Confirmed).

H6: there is a significant positive relationship between job satisfaction and organization commitment (Confirmed).

H7: there is a significant positive relationship between job satisfaction and job performance (Rejected).

H8: there is a significant positive relationship between Islamic work ethics and organization commitment (Confirmed).

H9: there is a significant positive relationship between Islamic work ethics and job performance (Confirmed).

The proposed model which was obtained from factor analysis of the factors with acceptable load is fairly appropriate to examine the relationships between the variables because as table 4 shows, the value of all criteria of appropriateness is greater than 90 percent which is very good. In respect with RMSEA, as the values are closer to zero, the appropriateness is better, and a value between 0.05 and 0.08 shows a very good appropriateness. Here the value of this criterion is 0.11 which does not confirm the appropriateness of the model. RMSEA shows that the performance of the remaining items in the model is fairly weak.





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Although  $\chi^2$  is significant, this criterion is strongly sensitive to the sample size. However, the ratio of  $\chi^2$  to degree of freedom is smaller than 2.5 which is due to the sensitivity of  $\chi^2$  to the sample size. The appropriateness of the model of the relationships between the variables is good; furthermore, the significance greater than 0.05 also indicates the appropriateness of the model. The above table represents all the paths in the model. As it presents, the coefficient of regression is examined for all the paths. If the level of significance is smaller than 0.05 with a reliability of 95%, the corresponding null hypothesis is rejected. Rejection of null hypothesis shows the effectiveness of the corresponding path. The amount of this effect can be found in the column under standard estimation. This shows the strength of the path. A negative value of standard estimation (-) shows the reverse effect of response variable from independent variable (negative effect).

The final modified model presented above is appropriate to examine the relationships between the variables because as table 6 shows, the value of all criteria of appropriateness is greater than 90 percent which is very good. In respect with RMSEA, as the values are closer to zero, the appropriateness is better, and a value between 0.05 and 0.08 shows a very good appropriateness. Here the value of this criterion is 0.027 which confirms the appropriateness of the model. RMSEA shows that the performance of the remaining items in the model is fairly weak. Although  $\chi^2$  is significant, this criterion is strongly sensitive to the sample size. However, the ratio of  $\chi^2$  to degree of freedom is smaller than 1.112 which is due to the sensitivity of  $\chi^2$  to the sample size. The appropriateness of the model of the relationships between the variables is good; furthermore, the significance greater than 0.05 also indicates the appropriateness of the model.

## DISCUSSION AND CONCLUSION

Satisfying individuals' needs and creating motivation to improve the quality of their performance are among the most important issues in managing human force in organizations. Managers' attention to these issues indicates the significance of the employees to the managers as valuable assets. Since the efficacy of human force is not always predictable based on economical calculations, other various factors are also effective resulted from human superior needs in social, respective, and self-cognitive aspects (Hosseinzadeh and Saemian, 2003). Therefore, if we want to have efficient human force in organizations with optimum output, we should apply psychological findings and principles within the workplace (Kavousi, 1999).

Islam has certain explicit moral guidelines to control the relationships between organizations and employees. For example in case of employment, promotion, or any other decision making, when the manager is comparing the performance of one employee with that of others, he should pay every employee's rewards based on his performance and should treat them equally (Beik and Jamal, 2005). Therefore, with regards to the increasing role of organizations in today's societies, the communities' expectations –particularly, those committed to Islamic and moral ethics, such as Iran- of the organizations have increased. Therefore, not paying attention to these values in managing human forces can lead to significant crises for the organization. In fact, organizations' ignorance of these values and moral ethics can question the legitimacy and performance of the organizations, therefore affecting their successfulness (RahmaniSeresht et al., 2010).

Islamic work ethics has a significant positive relationship with organization commitment. This finding is in agreement with those of Yousef (2001) and Rahman (2006). Islamic work ethics has also a significant relationship with job satisfaction which confirms the findings of Week et al. (2004) and Schwepker (2001). It is also in agreement with the findings of Yousef (2001), Ku and Bu (2001), Vitel and Davis (1990), Alkaniz (2007) and Ambert and Hogan (2009). Furthermore, discovering the significant relationship between organization commitment and job satisfaction also confirms the findings of Markovitz et al. (2007), Alpander (1990), Testa and Mark (2005), Kzaleski (1988), Caspi and Lazar (1991), Matthew Zajak (1990) and Zaki (1382). Also it does not conform with the findings of Kurri et al. (1986) and Peterson et al. (2003).







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Since the employees are the most important assets in every organization including the banks, paying attention to their moral characteristics, needs and necessities of working lives should be among the most important concerns of bank managers. With regards to the significance of the employees' role and the effect of their performance in bringing forth the goals of the banks, not paying attention to the issues concerning with them is, in fact, ignorance. The pleasure which the bank employees experience when being identified with their workplace makes them committed to the goals of their organization. Therefore, it seems that increasing their commitment makes the employees ignore some of the deficiencies of their organizations, which should be regarded as a great opportunity to the banks.

This research confronted with certain limitations and obstacles. For instance, the employees were not inclined to complete the questionnaires because the findings of the previous research they had participated in were not applicable for them. However, it was tried to attract them by explaining the significance of the study. Moreover, lack of research sources concerning Islamic ethics was another difficulty, particularly for comparison of the findings. Finally bank managers are recommended to try to identify the moral codes, intrinsic motivation, and the variables affecting job satisfaction, job performance, and organization commitment in respect with their employees. Moreover, the researchers are also recommended to study Islamic work ethics with other variables and in other organizations.

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**Table1. Confirmatory factor analysis of research variables**

|               |                   | Islamic work ethics | Intrinsic motivation | Job satisfaction | Organization commitment | Job performance |
|---------------|-------------------|---------------------|----------------------|------------------|-------------------------|-----------------|
| KMO           |                   | 0.837               | 0.624                | 0.845            | 0.835                   | 0.907           |
| Bartlett Test | $\chi^2$          | 858.3               | 53.97                | 1221.56          | 1307.664                | 1138.585        |
|               | Degree of Freedom | 136                 | 3                    | 210              | 190                     | 105             |
|               | Significance      | 0.00                | 0.00                 | 0.00             | 0.00                    | 0.00            |

**Table2. Factor load of the research variables**

| Job performance |      | Organization commitment |      | Job satisfaction |      | Intrinsic motivation |      | Islamic work ethics |      |
|-----------------|------|-------------------------|------|------------------|------|----------------------|------|---------------------|------|
| Factor load     | Sign | Factor load             | Sign | Factor load      | Sign | Factor load          | Sign | Factor load         | Sign |
| .818            | r4   | .779                    | q45  | .718             | q27  | .803                 | q20  | .679                | q12  |
| .806            | r6   | .708                    | q54  | .695             | q26  | .761                 | q18  | .666                | q17  |
| .766            | r3   | .702                    | q46  | .677             | q28  | .692                 | q19  | .659                | q13  |
| .764            | r15  | .695                    | q50  | .659             | q40  |                      |      | .643                | q15  |
| .751            | r11  | .693                    | q60  | .642             | q29  |                      |      | .640                | q4   |
| .716            | r5   | .687                    | q61  | .626             | q31  |                      |      | .627                | q11  |
| .697            | r14  | .670                    | q49  | .623             | q32  |                      |      | .570                | q8   |
| .672            | r9   | .638                    | q42  | .614             | q41  |                      |      | .563                | q10  |
| .660            | r12  | .608                    | q59  | .598             | q25  |                      |      | .562                | q1   |





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|      |     |      |     |      |     |  |  |      |     |
|------|-----|------|-----|------|-----|--|--|------|-----|
| .650 | r7  | .582 | q44 | .595 | q37 |  |  | .551 | q6  |
| .644 | r2  | .581 | q57 | .593 | q33 |  |  | .548 | q3  |
| .638 | r10 | .578 | q53 | .566 | q30 |  |  | .532 | q16 |
| .585 | r8  | .552 | q55 | .559 | q23 |  |  | .523 | q2  |
| .537 | r1  | .542 | q52 | .492 | q22 |  |  | .464 | q5  |
| .451 | r13 | .459 | q43 | .490 | q34 |  |  | .461 | q14 |
|      |     | .445 | q47 | .489 | q35 |  |  | .455 | q7  |
|      |     | .440 | q51 | .468 | q24 |  |  | .374 | q9  |
|      |     | .391 | q58 | .454 | q38 |  |  |      |     |
|      |     | .254 | q48 | .418 | q36 |  |  |      |     |
|      |     | .209 | q56 | .414 | q39 |  |  |      |     |
|      |     |      |     | .203 | q21 |  |  |      |     |

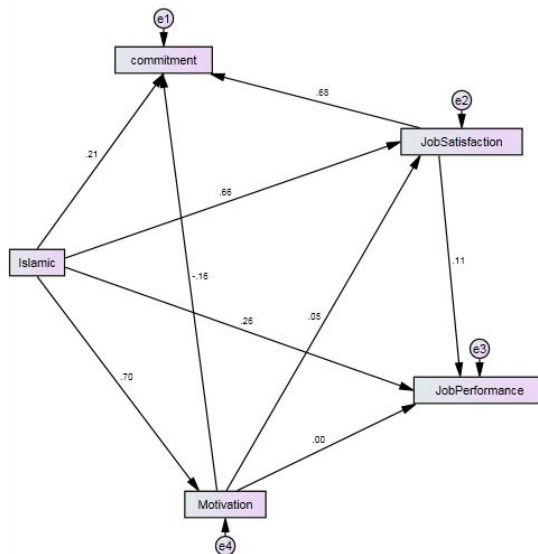


Figure1. Structural equations model

Table3. Investigating the paths in the model

| Path  | Standard Estimation | S.E.  | C.R.   | Significance | Result    |
|---|---------------------|-------|--------|--------------|-----------|
| Islamic Ethics ---> Job Satisfaction        | 0.66                | 0.087 | 8.155  | ***          | Confirmed |
| Islamic Ethics ---> Job Performance         | 0.259               | 0.123 | 2.041  | 0.041        | Confirmed |
| Islamic Ethics ---> Organization Commitment | 0.208               | 0.108 | 2.338  | 0.019        | Confirmed |
| Islamic Ethics ---> Intrinsic Motivation    | 0.705               | 0.071 | 12.375 | ***          | Confirmed |



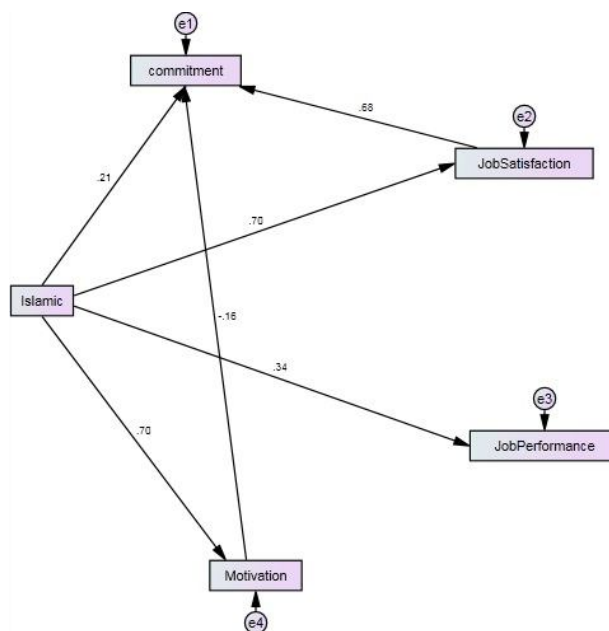


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|  |        |       |        |       |           |
|--|--------|-------|--------|-------|-----------|
| Intrinsic Motivation ----> Job Satisfaction        | 0.054  | 0.07  | 0.669  | 0.504 | Rejected  |
| Intrinsic Motivation ----> Job Performance         | 0.002  | 0.083 | 0.02   | 0.984 | Rejected  |
| Intrinsic Motivation ----> Organization Commitment | -0.157 | 0.072 | -2.111 | 0.035 | Confirmed |
| Job Satisfaction ----> Job Performance             | 0.11   | 0.095 | 1.048  | 0.295 | Rejected  |
| Job Satisfaction ----> Organization Commitment     | 0.679  | 0.083 | 9.191  | ***   | Confirmed |

**Table4. Model Appropriateness**

| RFI  | IFI   | CFI   | NFI   | RMSEA | Significance | DF/ $\chi^2$ |
|------|-------|-------|-------|-------|--------------|--------------|
| 0.92 | 0.995 | 0.995 | 0.992 | 0.111 | 0.089        | 2.9          |



**Figure2. Final modified model**

**Table5. Examining the paths in the model**

| Path                                  | Standard Estimation | S.E.   | C.R.   | Significance | Result    |
|---------------------------------------|---------------------|--------|--------|--------------|-----------|
| Islamic Ethics ----> Job Satisfaction | 0.698               | 0.062  | 12.146 | ***          | Confirmed |
| Islamic Ethics ----> Job Performance  | 0.338               | 0.073  | 4.469  | ***          | Confirmed |
| Islamic Ethics ----> Organization     | 0.207               | 0.0109 | 2.298  | 0.022        | Confirmed |





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|   |        |       |        |       |           |
|---|--------|-------|--------|-------|-----------|
| Commitment  |        |       |        |       |           |
| Islamic Ethics ---> Intrinsic Motivation          | 0.877  | 0.071 | 12.375 | ***   | Confirmed |
| Intrinsic Motivation ---> Organization Commitment | -0.153 | 0.072 | -2.114 | 0.035 | Confirmed |
| Job Satisfaction ---> Organization Commitment     | 0.761  | 0.083 | 9.204  | ***   | Confirmed |

**Table6. Model appropriateness**

| RFI   | IFI   | CFI   | NFI   | RMSEA | Significance | DF/ $\chi^2$ |
|-------|-------|-------|-------|-------|--------------|--------------|
| 0.969 | 0.999 | 0.999 | 0.998 | 0.027 | 0.349        | 1.112        |





## RESEARCH ARTICLE

## Analyzing Intramuscular Progesterone Effect in Treatment of Preterm Labor in Pregnant Women with Gestational Ages 34 to 37 Weeks in Akbar Abadi Hospital

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Received: 18 Mar 2015

Revised: 16 Apr 2015

Accepted: 29 May 2015

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### ABSTRACT

This study was performed to determine the effect of progesterone in treatment of preterm labor in pregnant women admitted to Akbar Abadi hospital at gestational age of 34 to 37. In this Comparative Descriptive study, 106 women with regular and painful uterine contractions, hospitalized with a diagnosis of PTL or threatened PTL in Akbar Abadi Hospital of Iran University of Medical Sciences, in 2013-2014 were studied. Patients were classified into two groups receiving intramuscular progesterone or placebo. All information including demographic data, history of PTD, maternal outcomes including birth GA, PTL, the time required for the disappearance of contractions and fetal outcomes including low birth weight, need for NICU, first and fifth minute APGAR, neonatal complications were entered in data entry forms. Finally the data were analyzed by the SPSS statistical software v.20. The mean age, body mass index, Gravity, parity, number of abortions, the number of dead child, history of preterm birth, infertility and history of cerclage had no significant difference between the two groups. Persistent uterine contractions in the progesterone group were significantly more than the control group (Pvalue: 0.03). First minute APGAR of the infants in progesterone group was significantly higher than the control group (Pvalue: 0.04). Using progesterone is effective in reducing the rate of preterm delivery. For a better interpretation of the results of treatment with progesterone further studies should be done with more populations.

**Key words:** Preterm labor, intramuscular progesterone, treatment of preterm labor.



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## INTRODUCTION

Preterm labor refers to labor before 37 weeks of pregnancy the prevalence of which varies between 6-12% in the developed countries and the risk of recurrence in subsequent pregnancies is 8%. Preterm labor is more common in developing countries, which is considered as over 85% of the prenatal and neonatal mortality (4-1). The survival rate of premature infants' increases with gestational age. In addition to the issue of mortality, premature infants are exposed to physical and mental disorders and considerable costs are paid to keep them in neonatal intensive care units (7-5).

The precise etiology is unknown, but risk factors such as maternal factors, infections, mother's lifestyle and chronic diseases, hereditary and hormonal factors are known to affect it. One of the major risk factors is prior preterm labor that with each preterm delivery the risk of subsequent preterm birth increases (8). Preterm birth was associated with increased maternal cardiovascular events in mother (9). Progesterone is the main human progestin in recent years applied in the treatment of premenstrual syndrome, labor depression, RPL threat, prevention of preterm delivery and luteal phase support in IVF (12, 13). Progesterone is one of the essential hormones secreted by the placenta to survival during pregnancy. It also seems that that progesterone plays a role in the uterus relaxation during the latter half of pregnancy. Loss of progesterone function in the uterus would be the beginning of term and preterm delivery without significant changes in blood levels of this hormone in the final weeks of pregnancy. In addition progestin prevents the fetal membrane component apoptosis in basic and proinflammatory conditions which leads to prevention of rupture of membranes which is one of the factors of premature labor. The effects of progesterone products on the population at risk has been addressed in many studies and its best performance conditions are in reducing the risk of preterm labor in women with the history of previous preterm delivery or the subjects with short cervix during recent pregnancy (14).

It has been discussed in the sources that intramuscular injections of progesterone in women with a history of preterm labor and the use of vaginal progesterone in women with short cervical length has priority. However, the majority of clinical studies have not compared the effectiveness of different methods of prescription of progesterone directly. 17 alpha-hydroxyprogesterone has been studied since 1960 to evaluate the safety and effectiveness in the prevention of preterm delivery. Hydroxyprogesterone caproate is a synthetic progesterone with lowest androgenic effect the common dosage and deep intramuscular weekly injection of 250 mg starting at 16 weeks of pregnancy. Progesterone has been prescribed for pregnant women for more than 15 years. Although non-statistical studies presented evidence of an increased risk of miscarriage and fetal death facing with progestin products, other studies did not confirm it. Meanwhile, concerns about the exposure of hypospadias in male fetuses was reported which is related to the encounter before 11 weeks of pregnancy. Also, some studies claimed 3 times increased risk of gestational diabetes that has not been confirmed in extensive studies (15).

Treatment with progesterone reduces the risk of preterm labor in singleton pregnancies to a third, however this treatment is not effective in twin and triplet pregnancies (16). Some studies have reported similar results (18, 17). Meis et al (2003) reported that the rate of preterm delivery in patients receiving progesterone decreased significantly (17). Similarly, in a study conducted on 142 pregnant women at risk for preterm delivery found that the risk of preterm delivery was reduced significantly in patients receiving 100 mg daily vaginal progesterone (18). American College of Obstetrics and Gynecology formed a committee in which the use of progesterone to prevent preterm labor was supported (19). However some older studies have presented opposite results in the investigation of the effect of progesterone in the prevention of preterm labor (20, 21). With regard to the cases cited and uncertainty and disagreement regarding the use of progesterone in the treatment of cases of preterm labor, as well as high incidence of preterm labors, mortality and morbidity and related complications we decided to develop this study to investigate the effects of intramuscular progesterone in the treatment of preterm labor in pregnant women referring to Akbar Abadi hospital in gestational age of 34 to 37 weeks.





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## MATERIALS AND METHODS

This study was performed based on comparative- descriptive method in Akbar Abadi hospital maternity ward in 2013-2014. Pregnant women complaining of pain in preterm gestational age of 34-36 weeks and 6 days (Late onset preterm labor) in Akbar Abadi hospital maternity ward were investigated and treated. Pregnant women were included in the study and they were provided with information about the study and in case of admission to participate in the study, written informed consent was taken from them. Exclusion criteria included: unexplained bleeding during labor, evidence of rupture of membranes, uterine overdistention like multiple polyhydramnios, high fever over 38 degrees, IUGR, evidence of fetal distress (non-reassuring fetal heart), pregnancy diabetes, oligohydramnios, high blood pressure equal or over 90/140 and history of cesarean.

In this study, pregnant women's history with complaints of pain in labor age pregnancy 34 to 37 weeks (by precise LMP or sonography below 20 weeks or both) was collected by an assistant. Fetal heart was auscultated and abdominal examination was performed to analyze pressure decreases and uterine contractions and vaginal examination was performed to determine the Bishop score. They rested in Abadi hospital labor ward after being hospitalized. 500cc ringer lactate was prescribed within thirty minutes for hydration and sedation 50 mg intramuscular pethidine was injected. CBCdiff.U / AU / C tests were ordered. During the labor fetal heart rate auscultation was performed and recorded every 15 minutes for 2 hours and then every thirty minutes and mother's vital signs were recorded every 4 hours. In case of persistent uterine contractions and Bishop score equal or less than five after an hour patients were classified into groups A and B:

Group A: patients were prescribed 300 mg injection of progesterone (progesterone in oil 50 mg × 6- made in Iran hormone) in the form of deep muscle injection of 150 mg per Batk and 12 mg injection of betamethasone to accelerate fetal lung maturity within 5 hours and followed up for 8 hours (according to the peak effect of intramuscular progesterone drug information- up to date) the result of which was analyzed in three groups:

1- If the contractions stopped during 8 hours or there were at least two uterine contractions in ten minutes, and Bishop Score was still 5 successful treatments was considered. The patients were discharged within 12 hours in the absence of uterine contractions and they received 250 mg hydroxyprogesterone caproate (Shafayab Gostar company proloton depot 250 mg/ml) per week until the end of pregnancy as maintenance therapy and followed up to the time of delivery weekly and they were analyzed at the end of pregnancy they were analyzed based on gestational age at delivery, birth weight and 1 and 5-minute birth APGAR.

2- Uterine contractions in patients (three to five times within 10 min) persisted after 8 hours. In this case there were two groups:

- Bishop score equal to or higher than 6
- Bishop score equal to or higher than 5 that both groups were followed up until delivery

3- Another group delivered in less than 8 hours.

Group B: In these patients in order to accelerate fetal lung maturation 12 mg intramuscular betamethasone was prescribed and they were followed up. The outcome of Group B was also reported as three groups:

a) In case that the contractions stopped or had two uterine contractions within ten minutes and had a maximum Bishop score of 5. These patients could be discharged within 12 hours in the absence of uterine contractions and they were followed up on a weekly basis without medication. By the end of pregnancy they were analyzed based on gestational age at delivery, birth weight and 1 and 5-minute birth APGAR.

b) Uterine contractions in patients as (three to five times within 10 minutes) continued after 8 hours, where we had two groups:





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- ✓ Maximum Bishop score of five
- ✓ Bishop score equal to or higher than 6 that were followed up until delivery in both cases.

Data were analyzed by SPSS V.20 software. P-value <0.05 was considered as significant level.

## RESULTS

109 women with preterm labor pains entered this study. 53 subjects under study were randomly assigned to group A. During the first 8 hours of study 2 subjects had spotting and 1 subject has a cesarean due to a drop in heart rate so a total of 50 patients were evaluated in group A. 56 patients were studied in group B. Subjects aged between 18 and 36 years old. There was no significant difference in age between the two groups A and B (P.value: 0.8). BMI range of subjects varied between 22-35 and body mass index between had no significant difference between the two groups (Pvalue: 0.27). Information on obstetric history of subjects is given in Table 1. There was no significant difference between gravidity, parity, number of abortions, the number of dead children, history of preterm labor, infertility history, history of cerclage (P.value>0.05) (Table 2).

## DISCUSSION AND CONCLUSION

In this study we evaluated the effect of intramuscular progesterone to inhibit preterm labor. Although preterm labor pain is one of the most common causes of hospitalization among pregnant women, predicting exactly which uterine contraction will lead to premature delivery is difficult. Progesterone as one of the hormones secreted by the placenta is essential for pregnancy survival and it seems to play a role in maintaining uterus peace and maintenance in the latter half of pregnancy. The reduced performance of uterus leads to the beginning of term and preterm delivery without significant changes in blood levels of this hormone in the final weeks of pregnancy. In addition progesterone prevents the fetal membrane component apoptosis in basic and proinflammatory conditions which leads to prevention of rupture of membranes which is one of the factors of premature labor. Despite extensive clinical studies in preterm labor and considerable progress in midwifery science, still providing the best treatment to inhibit preterm labor is controversial. Unfortunately, during the last two decades, no progress has been occurred in reducing the rate of preterm delivery. In particular, due to birth complications related to late preterm infants 34 to 36 weeks more attention is given to them.

In February 2011 the Association of FDA America approved prescribing progesterone derivatives especially hydroxyprogesterone caproate to reduce the risk of preterm birth in women with a history of a preterm delivery and this was the first time that a drug to prevent preterm labor was confirmed by the FDA. In this study, intramuscular progesterone injections was effective in delaying preterm labor in the first 8 hours through the reduction of frequency of uterine contractions and lowering progress of Bishop score. Also the effects of progesterone in slowing the progression of Bishop score during the first 48 hours of study was observed (Pvalue: 0.005). Weekly injections of Proluton led to longer pregnancy duration especially in gestational age of 34-35 and improved e results of the Apgar score in the group receiving progesterone compared to the control group (Pvalue: 0.04). Results of the study conducted by Dr. Saqafi confirm this finding.

- Sanchez Ramos et al in a meta-analysis showed that the use of -17  $\alpha$  hydroxy progesterone reduced the rate of preterm delivery and low birth weight (26).
- Fonseca et al in (2007) conducted a study on 125 pregnant women with a history of preterm delivery and found that weekly injections of -17  $\alpha$  hydroxy progesterone reduced rate of preterm delivery (29% progesterone receiver group and 34.4% of the control group had a delivery under 34 weeks) (29).
- In this study, 20% of the study group and 25% of the control group had a deliver above 37 weeks.





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- Odibo et al (2006) reported that the injection injections of-17  $\alpha$  hydroxy progesterone in women with a previous history of preterm delivery before 37 weeks is effective in prevention of premature delivery and economically affordable (8).
- The study performed on twin pregnancies in 2007 showed that injecting 250 mg of hydroxy progesterone from the second trimester of pregnancy until the week 35<sup>th</sup> significantly did no reduce twin preterm labor significantly (32). In this study, we analyzed singleton pregnancies.
- It was reported in a review (2006) that progesterone prescription starting from week 16 of pregnancy reduces the risk of preterm delivery before 37 weeks of pregnancy (30).
- Also some older studies indicate the lack of progesterone effect in reducing the risk of preterm delivery (32, 31). These different results may be due to differences in the population type, dose and duration of the injection.

The use of progesterone is effective in reducing the rate of preterm delivery and it is recommended in order to interpret the results in a better way larger population would be studied.

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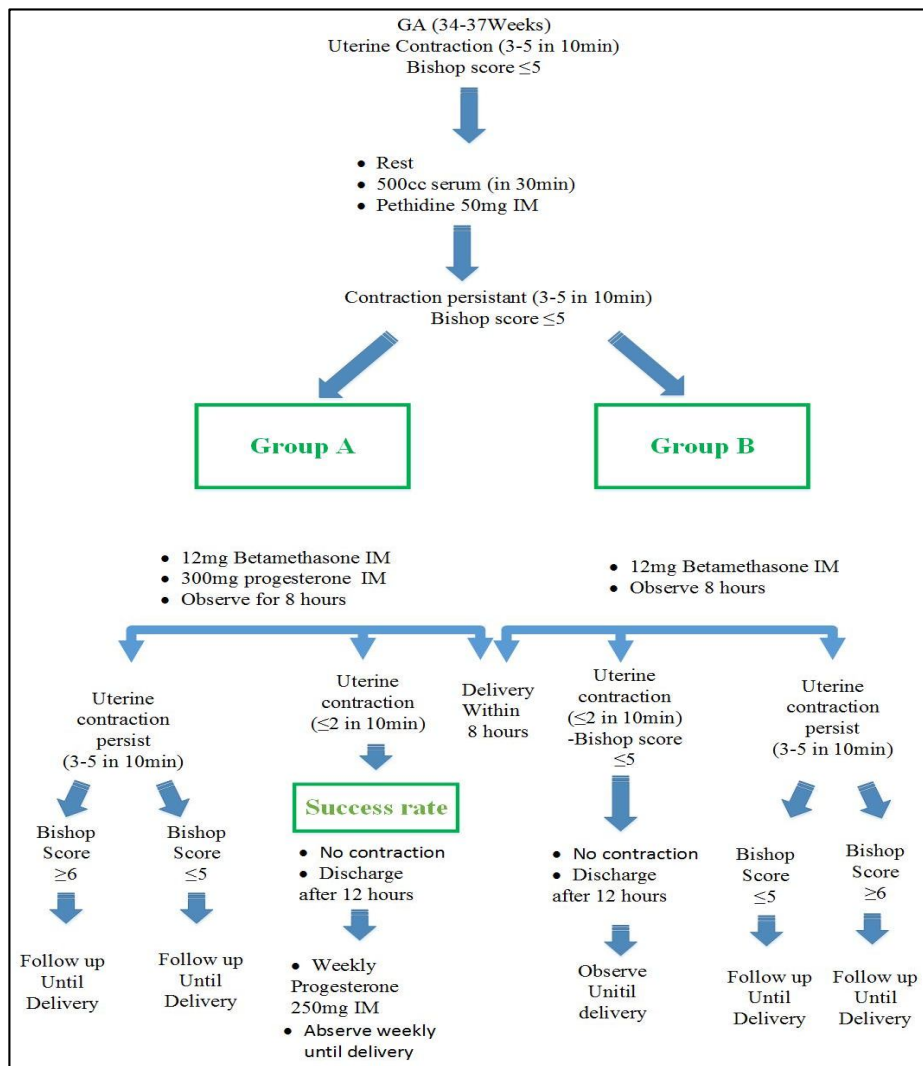
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Flow chart for Research Methodology





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Table 1. The comparison obstetric history of the two groups under study

|                                 | The group receiving progesterone | Without medication | P.value |
|---------------------------------|----------------------------------|--------------------|---------|
| <b>(G) Gravidity</b>            |                                  |                    | 0.98    |
| 1                               | (%36) 18                         | (%39.3) 22         |         |
| 2                               | (%26) 13                         | (%23.2) 13         |         |
| 3                               | (%24) 12                         | (%23.2) 13         |         |
| 4                               | (%12) 6                          | (%10.7) 6          |         |
| 5                               | (%2) 1                           | (%3.6) 2           |         |
| <b>(P) Parity</b>               |                                  |                    | 0.29    |
| 0                               | (%40) 20                         | (%50) 28           |         |
| 1                               | (%34) 17                         | (%32.1) 18         |         |
| 2                               | (%22) 11                         | (%8.9) 5           |         |
| 3                               | (%4) 2                           | (%7.1) 4           |         |
| 4                               | 0                                | (%1.8) 1           |         |
| <b>(A) Abortions</b>            |                                  |                    | 0.49    |
| 0                               | (%78) 39                         | (%66.1) 37         |         |
| 1                               | (%16) 8                          | (%28.6) 16         |         |
| 2                               | (%4) 2                           | (%3.6) 2           |         |
| 3                               | (%2) 1                           | (%1.8) 1           |         |
| <b>(Dead Child)</b>             |                                  |                    | 0.28    |
| 0                               |                                  |                    |         |
| 1                               | (%98) 49<br>(%2) 1               | (%100) 56<br>0     |         |
| <b>Cerclage</b>                 | (%7) 5                           | (%7.1) 4           | 0.59    |
| <b>Infertility history</b>      | (%10) 5                          | (%3.6) 2           | 0.18    |
| <b>history of preterm labor</b> | (%6) 3                           | (%3.6) 2           | 0.55    |

Information about the clinical characteristics of patients in the study is presented in Table 2.

Table 2: Data from two groups based on clinical characteristics at the time of inclusion

|                         | The group receiving progesterone | Without medication | P.value |
|-------------------------|----------------------------------|--------------------|---------|
| <b>(Mean ± SD)</b>      | (±0.94)3.1                       | (±1.2) 1.76        | 0.26    |
| <b>BISHOP Score</b>     |                                  |                    |         |
| <b>BISHOP Score ≤ 2</b> | (%54) 27                         | (%57.1) 32         | 0.90    |
| <b>Gestational age</b>  |                                  |                    | 0.28    |
| 34-35                   | (%42) 21                         | (%33.9) 19         |         |
| 35-36                   | (%38) 19                         | (%30.4) 17         |         |





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|              |         |            |
|--------------|---------|------------|
| <b>36-37</b> | (%14) 7 | (%19.6) 11 |
| <b>37-38</b> | (%6) 3  | (%16.1) 9  |

Outcomes of patients are shown in Table 3 during the first 8 hours of prescribing progesterone and 8 hours after administration of treatment

**Table 3: Treatment outcome in groups A and B during 8 hours of receiving progesterone**

|   | The group receiving progesterone | Without medication | P.value |
|---|----------------------------------|--------------------|---------|
| <b>uterine contraction<math>\leq</math>2 &amp; BISHOP<math>\leq</math>5(success )</b> | (%74) 37                         | (%46.4) 26         | 0.004   |
| <b>uterine contraction)(5-3 )&amp; BISHOP<math>\leq</math>5</b>                       | (%2) 1                           | (%8.9) 5           | 0.123   |
| <b>uterine contraction5-3) &amp; BISHOP<math>\geq</math>6</b>                         | (%16) 8                          | (%33.9) 19         | 0.03    |
| <b>Delivery with in 8 hours</b>   | ( %8 ) 4                         | (%10 ) 6           | 0.20    |

Table (4) presents the time between intervention and child birth in group A and its comparison with group B

**Table (4) Evaluating treatment impacts on both study groups**

|  | The group receiving progesterone | Without medication | P.value |
|--|----------------------------------|--------------------|---------|
| <b>Continued pregnancy</b>                   |                                  |                    |         |
| <b>48 hours or less:</b>                     |                                  |                    |         |
| o less than 8 hours                          | (%20) 10                         | (%53.6) 30         | 0.005   |
| o 8-24 hours                                 | (%40) 4                          | (%20) 6            | 0.20    |
| o 24-48 hours                                | (%30) 3                          | (%53.3) 16         | 0.20    |
| <b>1 week</b>                                | (%30) 3                          | (%26.7) 8          | 0.83    |
| <b>2-1 weeks</b>                             | (%42) 21                         | (%30.4) 17         | 0.59    |
| <b>3-2 weeks</b>                             | (%16) 8                          | (%3.6) 2           | 0.06    |
| <b>More than 3 weeks</b>                     | (%14) 7                          | (%7.1) 4           | 0.24    |
| <b>Type of labor</b>                         | (%8) 4                           | (%5.4) 3           | 0.58    |
| <b>NVD</b>                                   |                                  |                    | 0.78    |
| <b>C/S</b>                                   | (%58) 29                         | (%55.4) 31         |         |
| <b>(SD<math>\pm</math>Mean) Birth weight</b> | (%42) 21                         | (%44.6) 25         |         |
|  | 2885 $\pm$ 582.2                 | 2853.2 $\pm$ 515.4 | 0.76    |
| <b>1<sup>st</sup> min APGAR</b>              |                                  |                    | 0.04    |





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|                                 |     |          |            |      |
|---------------------------------|-----|----------|------------|------|
|                                 | 7 < | (%94) 47 | (%87.5) 49 |      |
| <b>5<sup>th</sup> min APGAR</b> |     |          | (%87.5) 49 | 0.68 |
|                                 | 7 < | (%90) 45 |            |      |

Pregnancy duration in group A, who referred at 34<sup>th</sup> week, was longer than other weeks of pregnancy and continued more than one week in 44% of the cases (Figure 1)

80%\* of group A and 75% of group B gave birth in gestational age less than 37 weeks.

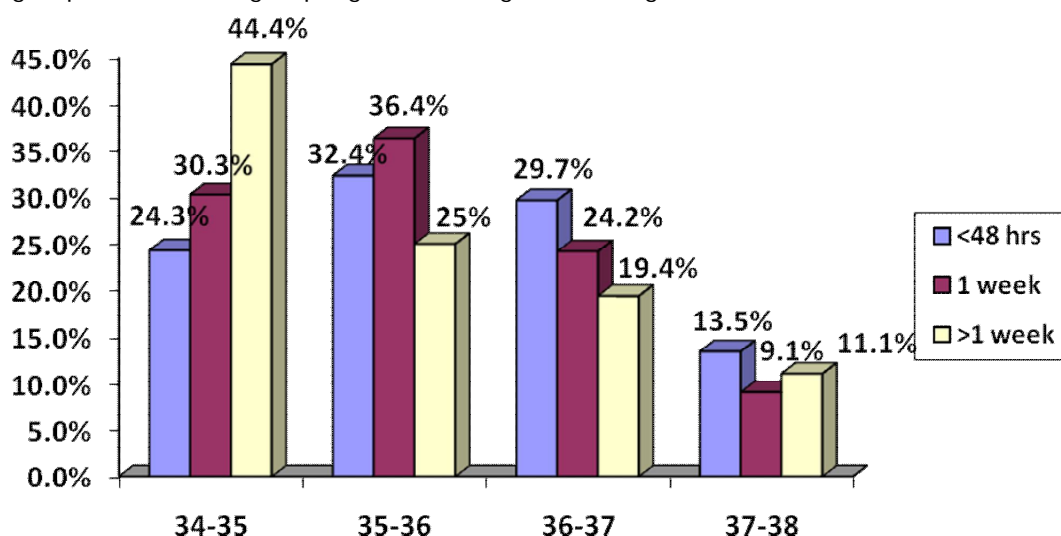


Figure 1: Time distribution of pregnancy continuation based on gestational age in group A

Table (5) presents frequency of subjects based on gestational age and the number of received Proluton dosage. The highest received Proluton dosage was 4 that were observed in 3 subjects who were in week 34<sup>th</sup> of pregnancy.

Table 5: Distribution of frequency of subjects based on gestational age and the number of received Proluton dosage

|                   | 0 dose     | 1 dose     | 2 doses   | 3 doses  | 4 doses  |
|-------------------|------------|------------|-----------|----------|----------|
| <b>week 34-35</b> | (%40) 14   | (%25.7) 9  | (%17.1) 6 | (%8.6) 3 | (%8.6) 3 |
| <b>week 35-36</b> | (%42.4) 14 | (%30.3) 10 | (%18.2) 6 | (%9.1) 3 | 0        |
| <b>week 36-37</b> | (%73.1) 19 | (%15.4) 4  | (%7.7) 2  | (%3.4) 1 | 0        |
| <b>week 37-38</b> | (%75) 9    | (%16.7) 2  | (%8.3) 1  | 0        | 0        |







## The Investigation of the Seismic Excavation Effect of Karim Khani Monument Twin Tunnels under Near Field Earthquake

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Received: 22 Mar 2015

Revised: 21 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

One of the main transportation ways are the underground tunnels. Some of these tunnels are constructed in mountainous areas along the route between the cities and others are established in the city's platform and terrestrial environment as urban railway path. We can say tunnels have a good stability if they have been constructed in the homogeneous, elastic, deep environment and had circular cross section. The tunnel's static and dynamic behavior analysis is important if any of these conditions exist. The purpose of this study is evaluation of the seismic drilling effect of Karim Khani Monument twin tunnels under near field earthquake. In the present study coded Henkel function is used and offered as mathematical model by using Matlab software according to the dimensions, distance and soil characteristic of two tunnels that is studied in previous articles. Data is analyzed by Plaxis software that it is based on the finite element method; Matlab software and SPSS statistical software are applied for neural network analysis using appropriate boundary conditions according to input data. The results suggest that significant statistical difference has occurred in the horizontal shift values by earthquake radiation angle changing between 0 - 90 degree. It can be concluded the soil freedom degree in horizontal direction is more than vertical direction for the same acceleration mapping per time according to more maximum shift for horizontal than vertical direction in 45 degree earthquake radiation angle in the near field earthquakes. The meaningful statistical difference has occurred in the yield function's value with increasing in earthquake radiation angle from 0 to 90 in the near field earthquakes. The Northridge earthquake is crucial for optimize layout sensors in the radial interval,  $r_1$  from 0 to 4.83 meter for near field earthquake.

**Key words:** Karim Khani Historic Building, Seismic Effects, tunnel, scattering.





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## INTRODUCTION

According to the tunnel and underground structure constructing development, especially in areas of seismic in recent decades, accurate calculations of such structures is inevitable. Maximum forces on the tunnel must be considered in the tunnel design that one of these forces is earthquake. The seismic wave's behavior recognizing about how spread through the tunnel that can gain an understanding of the structural design of the tunnel (Hajati et al. 1390). We need to reinforce the structure of the tunnel against the forces in many cases according to importance of the problem and the technical and economic requirements. Thus, the researchers emphasize dynamic stress on the tunnel caused by seismic waves cannot be ignored. In general, scattering methods for seismic wave's analysis are divided into two main categories: Analytical methods and numerical methods. The wave expansion functions of the analytical methods are widely used to simulate wave's diffraction. In numerical methods problem simulated and analyzed like finite element method or the boundary element method. This study evaluates the effect of seismic waves scattering on the shift and its components and a new code provided to analyze tunnels in seismic areas (Lio et al. 2010).

Digging tunnels and other underground spaces, especially when it is earthquake lead to remove a portion of the soil mass and occurrence of significant changes in the state of tension. The results of these changes are the occurrence of strain in the soil mass. Thus, the effects of tunnels, both during excavation and operation, especially during occurrence an earthquake on the adjacent structures are very important. This importance will be increasing in the vicinity of historic buildings according to their material and spiritual values (amorosi et al. 2009). Research in this area has focused on the effects of seismic. Hamid Reza Vosoughifar (2007) in an article as "A review of the earthquake wave diffraction analysis through stones" studied the effects of earthquakes on underground structures that depends on several factors such as maximum acceleration, intensity and duration of an earthquake. Some deformation and stress changes was occurred when underground structures such as tunnels implementation excavation is done and tunnel cover is chosen according to these cases.

Assad Allah Nourzad and et al. (1382) in their article as "Evaluation of the effect of SH waves earthquake on elliptical tunnel by perturbation method" investigated the effect of SH waves, one the most destructive earthquake waves on elliptical tunnel with semianalytical method. Qijan Liu and et al. (2014) studied twice tunnel's behavior to harmonic seismic waves in completeness space. They offered numerical model for dynamic stress analysis to P and SV waves using mixed variable method. Qijan Liu and et al. (2013) studied P, SV and Rayleigh seismic waves scattering within the covered superficial tunnel in elastic space. They offered an analytical method to scatter earthquake waves in elastic space using inner plate variable theory and imaging method.

Seismic waves started from the epicenter of the earthquake, move through earth. If these waves collide to underground cavity such as tunnel lead to put about part of the wave and another part propagate in surround because of soil characteristic change. These phenomena called scattering (Safari and Nourzad 1388). In this study we investigate the effect of the following items:

Vibrations caused by the earthquake can be in forms of longitudinal (P waves), shear (SV waves) and Rayleigh waves. Each of these waves will have different effect on behavior of the tunnel.

Earthquake epicenter can be in close or far area.

The ratio of distance to radius of the tunnel can change

The intensity and frequency of the earthquake

Finally in order to numerical analysis, dynamic stress concentration factor is introduced and Graphs are plotted. The input signal is analyzed using the first order Henkel function and the output is scattered waves function. Boundary conditions are defined for function and the tunnel stability condition is examined by dynamic stress type recognition.





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## RESEARCH METHODOLOGY

Underground structures during an earthquake are most vulnerable in two main forms. Vibrations caused by the earthquake and ground rupture are two major reasons. Vibrations caused by the earthquake in form of longitudinal waves (PWave), shearing (SVWave) and Rayleigh waves affect the structure. So various deformations of the vibration occur would change structures on the ground also affected by this shifts. Therefore, by assuming dimensions and the certain distance between two tunnels and assumption of soil characteristics by using studies that have been done and previous articles and use of Matlab software Henkel function is coding and mathematical model is reported, by using boundary conditions corresponding to the input, Plaxis software output data that is based on finite element and Matlab software for analysis of neural network and SPSS statistical software was used. By using multivariate variance analysis test and calculation of value for all different states attempts have been done to have a correct data comparison.

Case study in this research is part of Shiraz subway lines with length of 24.1 kilometers, the tunnel diameter of 6 meters and the line number 1 of metro station. Based on performed studies, Shiraz Urban Railway System is comprised of three lines which in the first stage the Southeast - North West line will be built. This line will be equipped with 20 underground stations and a level station. This metro line passes from Karim Khan Monument, Pars monument, Vakil Bazaar and etc. Constructed tunnels is in the beneath of the underground water level, and generally located at silty, sandy clay soil. In this context, Karim Khani Monument at northeast of Shiraz and in Shohada Square (the former name of the municipality). Plan is a land with rectangular shape. Courtyard Monument was the Karim Khan and his family's Royal Palace that is located in a land with 12800 square meters area with about 4000 square meters Infrastructure. In the four corners of the monument there are four circular towers with about 14 meters height and walls height of 12 meters. External wall is a military fortress like walls. Thickness of the walls is 3 meters and 2.8 meters at the base and at the top respectively that has increased frustum. Monument foundation and walls made up of stone and bricks were used to build the rest of the building. Interior decoration include frames, marble plinth of Yazd and Tabriz, and large mirror of the Russian, Ottoman Turkey and Europe.

## RESEARCH FINDINGS

In this section we focus on examination of the results of the analysis. At first the horizontal, vertical and total shifts of Karim Khan Citadel structure is evaluated under near area earthquake before and after tunnel digging in various directions. The effects of the earthquake angles in geometry model are examined. Then, they yield function values at different points are studied. Finally smart sensor so optimized layout of the soil mass surrounding the Karim Khani Citadel building is expressed.

### Investigation of Karim Khan Citadel shift under seismic in then earby area

Figures 1 through 6 shows the horizontal, vertical and total shifts of Karim Khan Citadel structure under near area earthquake before and after tunnel digging in various directions. To investigate the effect of horizontal, vertical and total shifts, a point under the farther citadel building with coordinate (88.37, 104.8) and a point under the closer Citadel building with coordinate (25.37, 204.7) is chosen. Other figures for other earthquakes are given in the Appendix (2). The maximum amount of horizontal, vertical and total shifts are also given in Tables 1 to 3.

### Investigation of effective stress in the Karim Khan citadel under near field earthquake

Effective stress in Karim Khan Citadel structure under near field earthquake before and after the tunneling in different directions is shown in Figures 7 through 10. To investigate the effect of effective stress, a point under the





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farther citadel building with coordinate (37.88, 104.8) and a point under the closer Citadel building with coordinate(37.25, 204.7) is chosen.

#### The effects of the earthquake angles in geometry model under near field earthquake

For investigation the effect of radiation angle, a point under the farther citadel building with coordinate(37.88, 104.8) and a point under the closer Citadel building with coordinate(37.25, 204.7) is chosen. The Figures (11) through (20) shows  $u_x$ ,  $u_y$ ,  $u_t$ ,  $\sigma_x$ ,  $\sigma_y$  values for Chichi earthquake.

#### Investigation of critical state of main stresses under near field earthquake

F values versus t for Chichi earthquake with angles of earthquake of 0 degree are shown in figures 21 through 22.

#### Smart sensor so ptimized layout investigation

In this section the smart sensors optimized layout based on near-field earthquakes and finally have been determined with regard to the near earthquakes. Note that the earthquake name in the table represents earthquake that the maximum value of the objective function is located. These points have been determined in radial interval from 0 to 83.4 and 83.4 to 62.11 meters to the center of the building.

#### Optimized layout based on near field earthquake

In this section, taking into account the results from the Chichi and Kobe earthquake far field is location of the sensor according to the tables(4) and(5).

## CONCLUSION

Underground constructions such as tunnels play a major role in the transport and water industries. Urban tunnels such as subway tunnels are important structures that their properly functioning, have a matter of vital importance especially in the event of a major earthquake. Therefore, these structures must have sufficient strength against loads. In this study, we investigated the effects of seismic excavation of KarimKhani Citadel twin tunnels under near field earthquake.

By study the Shift and effective stress curves in the mentioned areas, the following conclusions can be expressed in different modes earthquake:

under near field earthquake the horizontal shifts are

in Chichi-0 : -2.59% , Chichi-37 : -1.24 % , Chichi-45 : -1.52 % , Chichi-54 : -1.46 % , Chichi-90 : -5.60 %

under near field earthquake the Vertical shifts are

Chichi-0 : -1.76 % , Chichi-37 : -1.2 % , Chichi-45 : -2.73 % , Chichi-54 : -4.51 % , Chichi-90 : -1.79 %





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Under near field earthquake the total shifts are

Chichi-0 : -1.44 % ,Chichi-37 :2.41 % ,Chichi-45 : -1.01 % , Chichi-54: -4.09 % ,Chichi-90 : -2.65 %

Under near field earthquake the sig-xx amounts are

Chichi-0 : 1.21 % , Chichi-37 :2.6 % ,Chichi-45 : 3.45 % , Chichi-54: 3.87 % ,Chichi-90 : 3.25 %

Under near field earthquake the sig-yy amounts are

Chichi-0: 2.45 % ,Chichi-37:3.65 % ,Chichi-45: 4.32 % ,Chichi-54: 4.45 % ,Chichi-90: 2.75 %

Furthermore, by investigation of the shift and effective stress curves at different earthquake states in mentioned areas the results can be expressed in following sections:

In near field earthquakes , the change in earthquake radiation angle from 0 to 90, can be made a significant statics different that observed in the horizontal shift:

In near field earthquakes , the change in earthquake radiation angle from 0 to 90, can be made a significant statics different that observed in the vertical shift:

In near field earthquakes , the change in earthquake radiation angle from 0 to 90, can be made a significant statics different that observed in the total shift:

In near field earthquakes , the change in earthquake radiation angle from 0 to 90, can be made a significant statics different that observed in the horizontal effective stress:

In near field earthquakes , the change in earthquake radiation angle from 0 to 90, can be made a significant statics different that observed in the vertical effective stress:

The effect of near field earthquakes cause a significant statics different in change of horizontal shift at equal angel of applied earthquake

The effect of near field earthquakes cause a significant statics different in change of vertical shift at equal angel of applied earthquake

The effect of near field earthquakes cause a significant statics different in change of total shift at equal angel of applied earthquake

The effect of near field earthquakes cause a significant statics different in change of horizontal effective stress at equal angel of applied earthquake

The effect of near field earthquakes cause a significant statics different in change of vertical effective stress at equal angel of applied earthquake

In near field earthquakes no change have been done in vertical and horizontal effective stress by the increase of earthquake radiation angel





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In near field earthquakes, the horizontal and vertical shift increase and decrease respectively due to the increase of earthquake radiation angle

In radiation angle of earthquake at 90 degree the maximum shift happened in Tabas, Kobe, Chi Chi, and North Ridge respectively.

Considering that the radiation angle of 45 degrees earthquake in near field earthquake horizontal shift maximum is more than vertical shift maximum, it can be inferred to the mapping for earthquake acceleration with the same amount of degrees of freedom in the vertical direction is more of horizon.

By examining the Yield function values submitted in the charts above, the following conclusions can be expressed in different modes earthquake:

In the near field earthquakes a significant statics different in values of Yield function happened by increasing in radiation angle from 0 to 90 ° C The time happening of maximum Yield function in varies state of near field earthquakes is between 11.26 to 13.58 sec and 4.36 to 9.12 sec in Tabas and North Ridge respectively, while their maximum acceleration happened 18.8 and 3.96 sec respectively. These results show the difference between time happening of maximum Yield function and maximum acceleration.

In Kobe , There is no clear relation between change in earthquake radiation angle and time that Yield function maximum is happened

In North Ridge, there is no change in the time happening of Yield function maximum by variation of earthquake radiation angle.

In Tabas, the variation of earthquake radiation angle can be made the time happening of Yield function maximum decreased or be constant.

In near-field earthquake, the increase in Yield function maximum occurred by increasing in earthquake radiation angle from 0 to 90 degree

In different applied angle of near field earthquake, the maximum of Yield function occurred at 90 degree of earthquake radiation angle.

By scrutinized of the optimized layout sensor the following results are achieved:

In the near-field earthquake for optimized layout sensor in radial intervals, r1 from 0 to 4.83 meters the North Ridge is crucial.

In the near-field earthquake for optimized layout sensor in radial intervals, r1 from 4.83 to 11.62 meters the North Ridge is crucial.

In the near-field earthquake for optimized layout sensor in radial intervals, r2 from 0 to 4.83 meter the Tabas is crucial.

In the near-field earthquake for optimized layout sensor in radial intervals, r2 from 4.83 to 11.62 meter the Tabas is crucial.

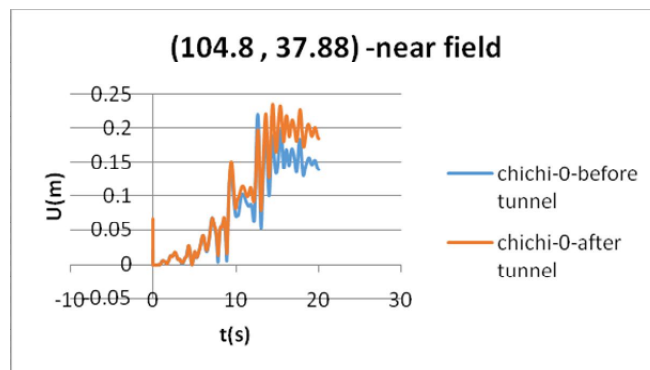




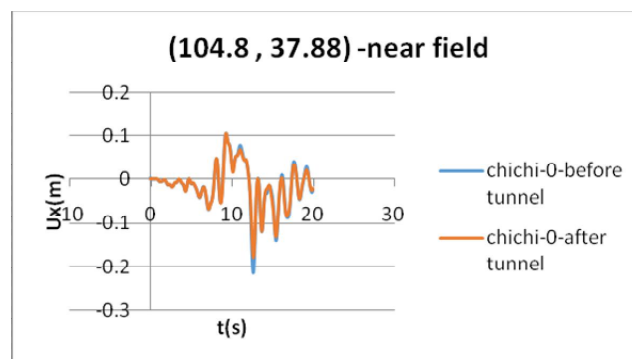
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**Figure1. The total shift of the farther Citadel under the Chichi earthquake before and after the Tunneling to 0' direction.**

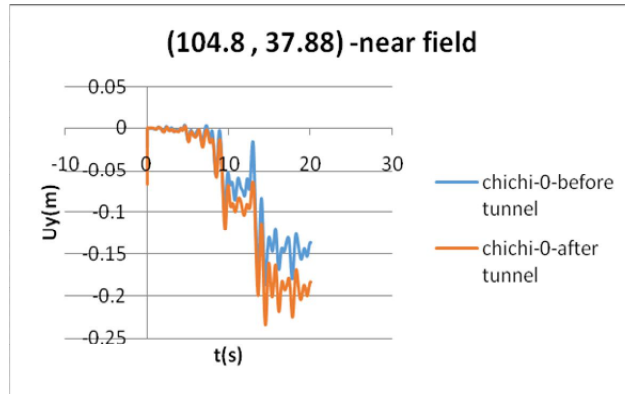


**Figure2. The horizontal shift of the farther Citadel under the Chichi earthquake before and after the tunneling to 0' direction.**

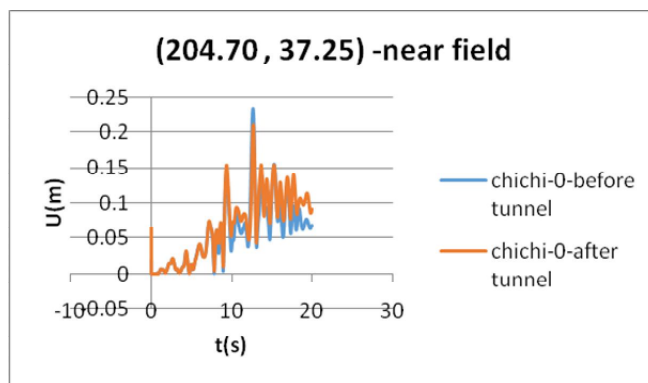




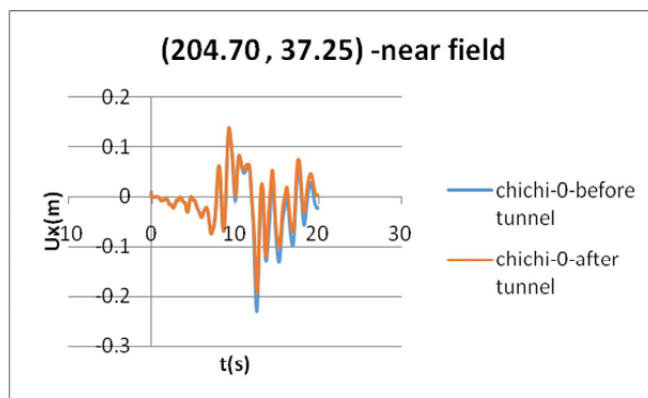
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**Figure3.**The vertical shift of the farther Citadel under the Chichi earthquake before and after the tunneling to 0' direction.



**Figure 4.**The total shift of the closer Citadel under the Chichi earthquake before and after the tunneling to 0' direction.



**Figure 5.**The horizontal shift of the closer Citadel under the Chichi earthquake before and after the tunneling to 0' direction.







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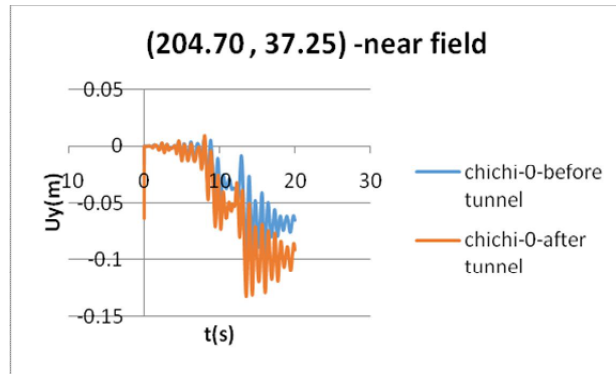


Figure 6.The vertical shift of the closer Citadel under the Chichi earthquake before and after the tunneling to 0' direction.

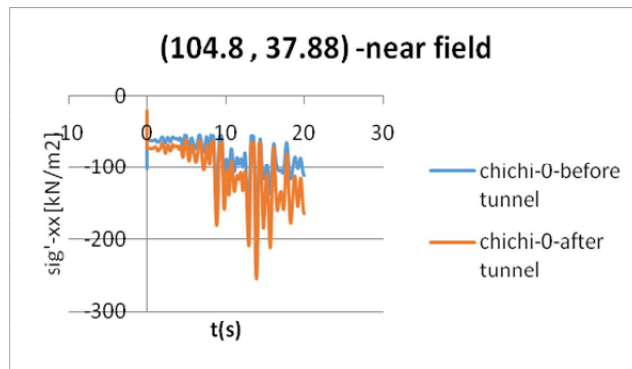


Figure 7.Investigation of Sig'-xx inthe farther Citadel under the Chichi earthquake to 0' direction.

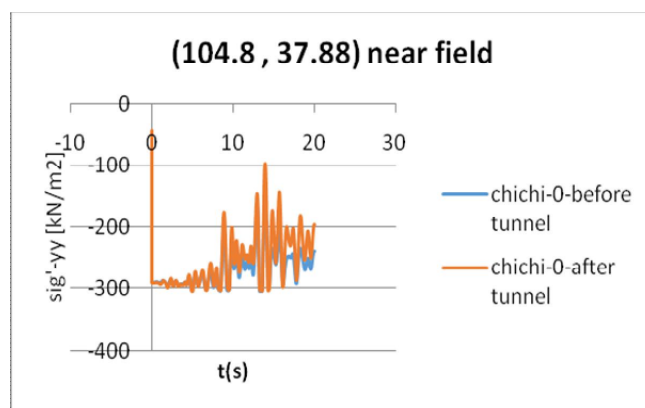
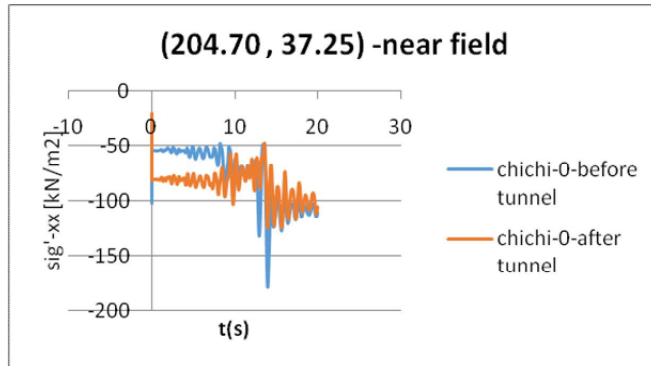


Figure 8.Investigation of Sig'-yy in the farther Citadel under the Chichi earthquake to 0' direction.

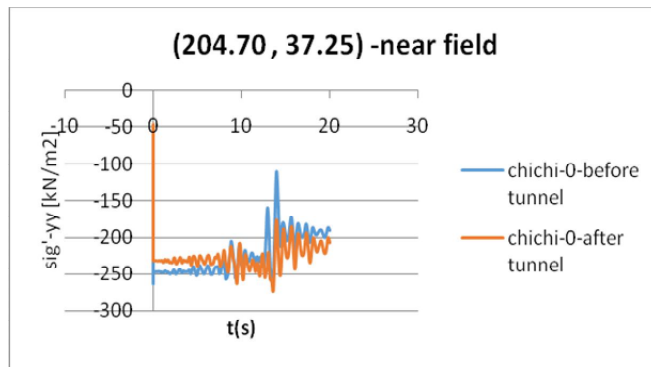




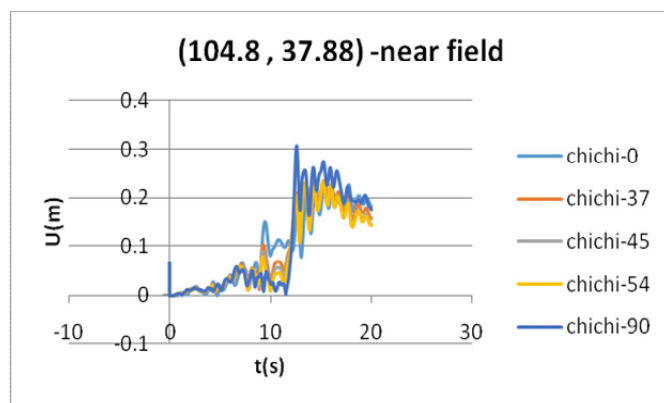
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**Figure 9.** Investigation of Sig'-xx in the closer Citadel under the Chichi earthquake to 0' direction.



**Figure 10.** Investigation of Sig'-yy in the closer Citadel under the Chichi earthquake to 0' direction.

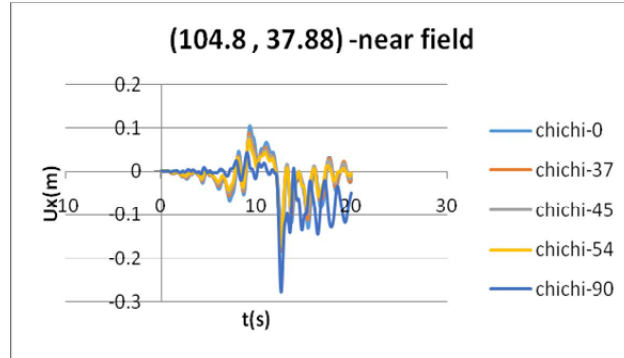


**Figure 11.** The total shift around the farther building under the Chichi earthquake in different angles of earthquake in geometry model.

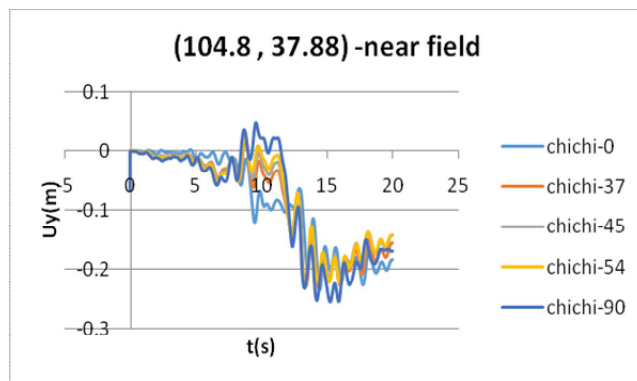




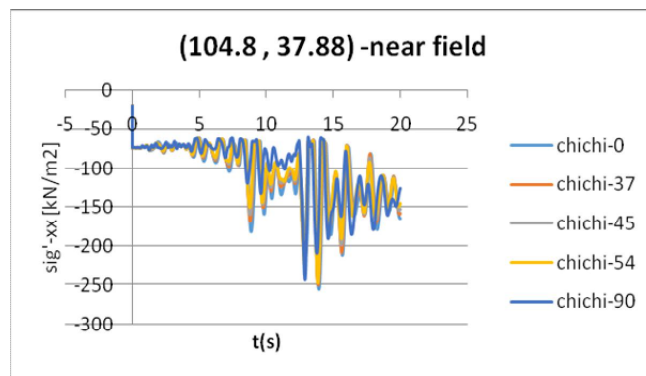
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**Figure 12.**The horizontal shift around the farther building under the Chichi earthquake in different angles of earthquake in geometry model.



**Figure 13.**The vertical shift around the farther building under the Chichi earthquake in different angles of earthquake in geometry model.

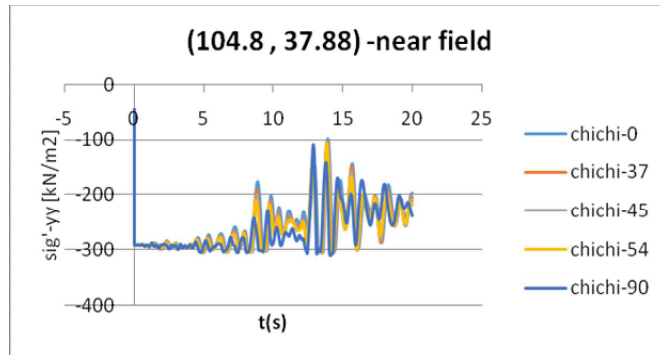


**Figure 14.**The effective stress around the farther building under the Chichi earthquake in different angles of earthquake in geometry model.

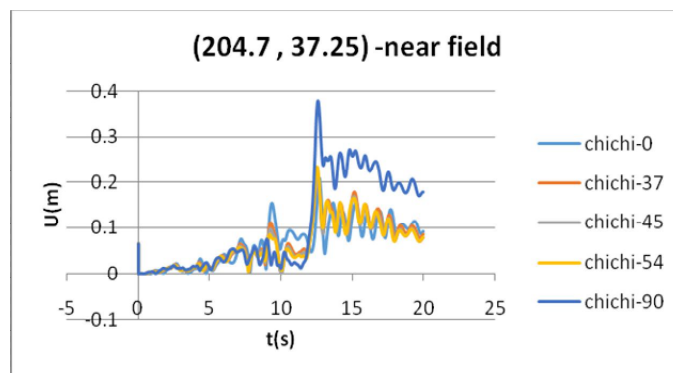




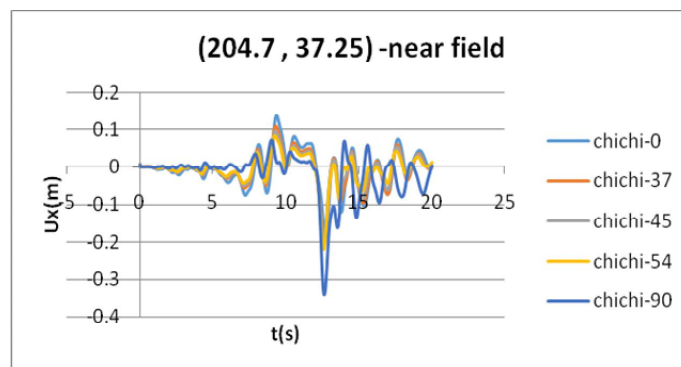
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**Figure 15.**The effective stress around the farther building under the Chichiearthquake in different angles of earthquake in geometry model.



**Figure 16.**The total shift around the closer building under the Chichiearthquake in different angles of earthquake in geometry model.



**Figure 17.**The horizontal shift around the closer building under the Chichiearthquake in different angles of earthquake in geometry model.





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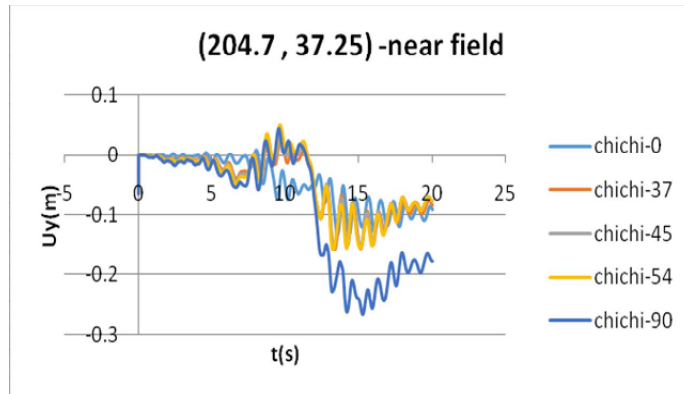


Figure 18. The vertical shift around the closer building under the Chichiearthquake in different angles of earthquake in geometry model.

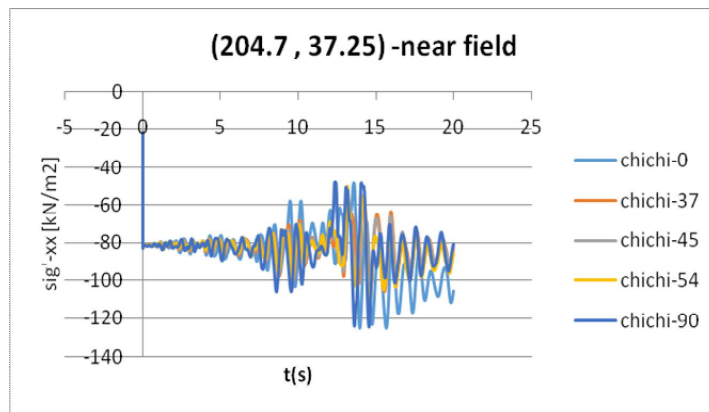


Figure 19. The effective stress around the closer building under the Chichiearthquake in different angles of earthquake in geometry model.

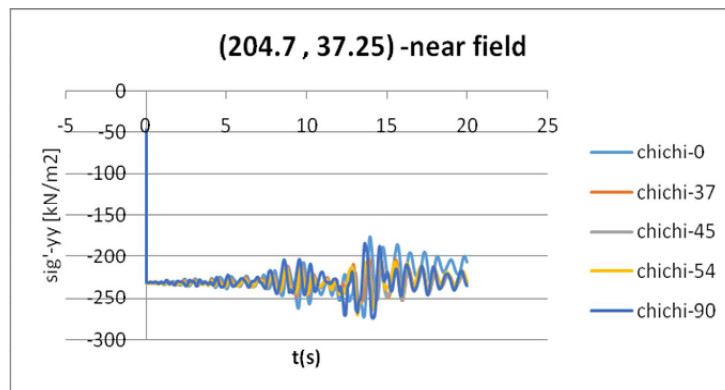
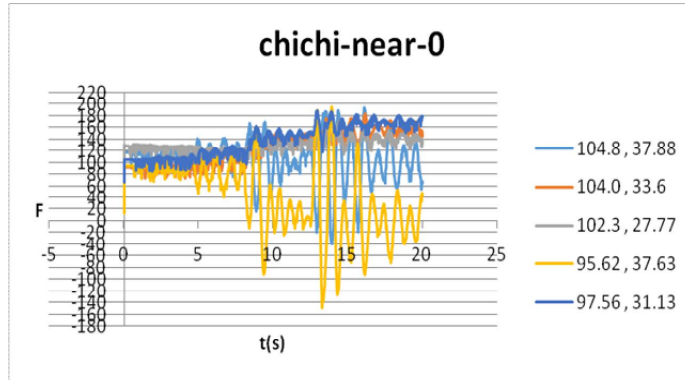


Figure 20. The effective stress around the closer building under the Chichiearthquake in different angles of earthquake in geometry model.

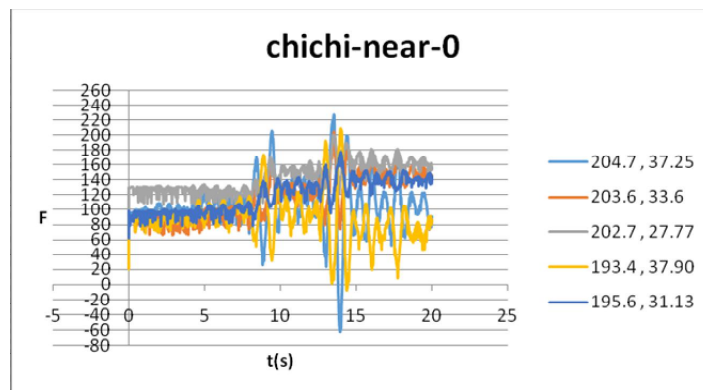




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**Figure 21. The yield function values during Chichiearthquake at different points around the buildings with 0 degree angle of earthquake in geometry model.**



**Figure 22. The yield function values during Chichiearthquake at different points around the buildings with 0 degree angle of earthquake in geometry model.**

**Table 1. The horizontal shift values under Chichi near field earthquake**

| Chichi earthquake                      | Chichi-0  | Chichi-37  | Chichi-45  | Chichi-54  | Chichi-90 |
|--|-----------|------------|------------|------------|-----------|
| The horizontalshift (Before tunneling) | 0.1052003 | 0.07653677 | 0.06522406 | 0.05825006 | 0.0497993 |
| The horizontalshift (After tunneling)  | 0.1049409 | 0.08901313 | 0.08044336 | 0.0728387  | 0.0441606 |





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**Table 2. The vertical shift values under Chichi near field earthquake**

| Chichi earthquake                    | Chichi-0  | Chichi-37  | Chichi-45  | Chichi-54  | Chichi-90 |
|--------------------------------------|-----------|------------|------------|------------|-----------|
| The verticalshift (Before tunneling) | 0.0038797 | 0.02057522 | 0.02624412 | 0.03207769 | 0.0652736 |
| The verticalshift (After tunneling)  | 0.0021189 | 0.02044948 | 0.026971   | 0.03252968 | 0.0480859 |

**Table 3. The total shift values under Chichi near field earthquake**

| Chichi earthquake                 | Chichi-0  | Chichi-37  | Chichi-45  | Chichi-54  | Chichi-90 |
|-----------------------------------|-----------|------------|------------|------------|-----------|
| The totalshift (Before tunneling) | 0.2209665 | 0.21043489 | 0.21694153 | 0.22704524 | 0.2039443 |
| The totalshift (After tunneling)  | 0.2353363 | 0.23450442 | 0.22705139 | 0.23114415 | 0.3055592 |

**Table(4): The location of the smart sensors in the vicinity of the buildings inearthquakeareas**

| Near field earthquake | Points Coordination | r <sub>1</sub> (m) | r <sub>2</sub> (m) | σ <sub>1</sub> ' | σ <sub>3</sub> ' | Earthquake Name |
|-----------------------|---------------------|--------------------|--------------------|------------------|------------------|-----------------|
| Left - Arg            | 87.342 , 33.61      | 8.99               | 18.27              | -37.817          | -84.193          | nor-54          |
|                       | 90.033 , 27.063     | 12.31              | 18.73              | -63.542          | -91.243          | nor-54          |
|                       | 109.897 , 31.301    | 16.47              | 8.57               | -110.062         | -37.817          | nor-90          |
|                       | 110.932 , 35.07     | 16.26              | 6.77               | -97.671          | -64.455          | nor-90          |





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**Table(5): The location of the smart sensors in the vicinity of the buildings in earthquake areas**

| Near field earthquake | Points Coordination | r <sub>1</sub> (m) | r <sub>2</sub> (m) | σ <sub>1</sub> ' | σ <sub>3</sub> ' | Earthquake Name |
|-----------------------|---------------------|--------------------|--------------------|------------------|------------------|-----------------|
| Right - Arg           | 187.132 ,<br>32.033 | 8.85               | 20.01              | -222.468         | -37.033          | nor-90          |
|                       | 190.828 ,<br>37.768 | 2.35               | 15.19              | -231.534         | -33.452          | nor-90          |
|                       | 207.44 , 34.888     | 14.93              | 4.04               | -210.237         | -121.438         | tabas-90        |
|                       | 210.834 ,<br>30.339 | 19.68              | 9.64               | -207.467         | -125.318         | tabas-90        |







## Factors Affecting on the Brand Credibility of Imported Products and Domestic Customer Loyalty: The Moderator Role of the Nationalist Sentiments

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Received: 24 Mar 2015

Revised: 25 Apr 2015

Accepted: 27 May 2015

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### ABSTRACT

The customer experience is the main motivating factor in the decisions related to the repurchase or reusing the brand. Many companies have failed in the field of marketing mix that is based on the needs of consumers. These companies have not reached a good understanding about the clients' power to be updated and cannot assure them of required confidence. Therefore, customer will be dissatisfied, and there is a lack of commitment in some cases. All of these items, directly or indirectly influence on brand credibility and customer loyalty. The purpose of this study was to investigate the factors affecting the validity of brands of imported product and domestic customer loyalty with the moderator effect of these nationalist sentiments. Accordingly, to achieve this goal, Data was collected from 384 customers of Appliance Co., Daya group and tested through structural equation modeling. The findings show the reliability of the brand credibility and customer loyalty has direct relationship but perceived quality has no effect on customer loyalty. The moderator role of the nationalistic feelings has the relationship with perceived quality but the effect of brand credibility on customer loyalty did not confirmed.

**Key words:** brand credibility, customer loyalty, nationalist sentiments, reliability.



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## INTRODUCTION

Due to the extremely cost of a new customer acquirement rather than to establish a broader and deeper relationships with current customers, the subject of customer loyalty to brand and recognition of its effective factors have particular importance. One of the causes of the creation and increase customer loyalty and his commitment is the brand's reliability. Brand credibility is one of the most valuable assets of any company. Brands that added credibility for customers can achieve a special place in the minds of consumers. The methodology used in this study was descriptive- correlational research with causal approach and in terms of purpose was regarded as practical research. In this study, the relationship between brand credibility (which is defined by the reliability and expertise) as the independent variable, satisfaction, loyalty and commitment as dependent variables and the relationship between satisfaction and loyalty with a willingness to change the brand and oral recommendation as independent variables are examined and also the relationship between continuance commitment and their willingness to change the brand were tested.

Commitment to loyalty and continuous commitment. Satisfaction has direct relationship with the obligation and oral advice to purchase. Commitment to loyalty has no relationship with two dependent variable (the tendency to change the brand and also oral recommendation for purchasing). Continuing commitment has no relationship with the tendency to change the brand. Handling customer is a matter of great importance in the services sector, where the trading models in relation to profitability depends on long-term relationship with the customer. This section examines satisfaction and service quality as a means to increase their customer retention. For this reason in this study, the role of the brand (name and address in workflow management and customer handling) examined the relationship service. This study contributes to the understanding of this fact that brand has a significant role in the management of long-term relationships with customers and explains the common management tools of contact with customer, satisfaction and service quality with brand credibility.

Workflow customer management is the priority of service industries such as banking industry. It is accepted in the marketing acquiring a new customer is extremely costly rather than to establish a broader and deeper relationship with existing customers. Customer understanding from issue of the validity of foreign brands is the major issue for imported marketers and sales managers that their companies face major companies to determine the credit or promoting the brand in the mind of the customer identification must have necessary insights related strategies. In this context, the problem is identification that what factors affect the trusting on brand of imported products and how credibility of the brand will lead to brand loyalty and if the nationalism of consumer has effect on the intensity of these relationships or not.

Therefore, to investigate the case, the consumers of Appliance Company Daya group have been investigated in this study to answer the research questions. Credit is an index that assesses consumer interest rate to organizations. Brand should have the characteristics that are valid to customer: (Keller, 2001.). 1-The people perception of organization: it must be competent and innovation 2-Reliability: it must be reliable and able to attract long-term customers 3-Suitability: the brand should be appealing and have fun and worth for the money spending. For the first time, two researchers named Ardam and Esvit in 1998 raised the issue of brand credibility. This individuals with regard to signaling theory could examine brand equity based on the client's opinion (Beak and et al., 2010). In this research it seeks to answer the question that what is the impact of factors affecting the validity of imported brands and domestic customer loyalty and what role the nationalist sentiment has among these factors.

### Theoretical Perceptions

Reliability and credibility: Despite the lack of a comprehensive definition of the concept of reliability, it is regarded as confidence in the state of mind that in which the purchase and sale are performed in vulnerable position. The person



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knows the seller is a good person, second the seller behavior is predictable and thirdly, the seller believes that seller in their behavior has the benevolence (Shirkhodae, 1995). Customer loyalty: today is the loyalty age including customer loyalty, loyalty, and customer, and loyalty management, loyalty to the principles, ideals and beliefs and so on. Several studies have shown that satisfaction is the key to ultimate success and profit. In fact, marketing concepts that tended to maintain this concept does not recognize it anymore but today only customers who have a sense of belonging to the organization are considered as the profitability and long-term investments of organization (Gee et al., 2008). Various scholars have offered numerous definitions for the loyalty that this subject is acceptable due to complex and multidimensional nature of fidelity (Soderlund, 2006).

Perceived value: Zithmal 1988 offered the most comprehensive definition of perceived value" :Perceived value is the overall assessment of consumer perceptions of the utility of a product or service based on the payments and received value".The definition is the most widely accepted definition globally of perceived customer value (Gallarza and Saura, 2006). Consumer nationalism influence on attitudes and buying behavior of consumers has been investigated in several studies. Sharma and Shrimp (1987) stated that consumer nationalism is the predictor of beliefs, attitudes, intentions and purchasing decisions of consumers of foreign products. In their research, they showed that nationalistic attitudes have a significant negative correlation with foreign products and their purchase intentions. Other researchers have examined nationalism impact on attitudinal variables such as the assessment of foreign products, evaluation of local products, preference to buy local products and willing to buy foreign products with similar characteristics (Sharma and Shrimp, 1995; Olsen et al., 1993; Klein et al., 1998).Customer satisfaction had no meaning in the past because the demand was greater than the production of goods and services, manufacturers and suppliers of products and services believed that production or supply of any product or service will buy with its customers. But in today's competitive world, the competitiveness of the market and increase customer access to various suppliers, these are the customers who decide what product or service and what quality should be provided to them (Najmi and Hosseini, 2004).In such circumstances, 91 percent of customers who do not meet their satisfaction will never buy from the same supplier (Clycomb and Martin, 2002).

**Background research**

Seyedjavadin et al. in 2010 performed a study in the field of impact assessments on industrial customer loyalty. Customer loyalty is one of the components of relationship marketing, especially in the industrial market is significant to emphasize it. One factor that plays a role in the formation of loyalty is trademarks of companies. Heidarzadeh et al (2011), performed a study titled the impact of brand credibility on customer loyalty of the banking industry. Customer handling is a matter of great importance in the services sector where models for profit depends on long-term relationships with customers. Sobhani fard et al (2012), has performed an evaluation titled "internal and external appliance brand strategies from the perspective of Iranian clients". Identification of the strengths and weaknesses of branding strategies are the major issues in marketing strategies. Wong et al (2013) performed a research examining the impact of customer satisfaction on customer loyalty.

The experimental study was about the health insurance industry in Hongkong. Zhou et al. in 2012 performed a research on how to produce brand communication through brand communities. This study was made to investigate the moderators' mechanisms that converts brand communities into brand communications. This study uses the example of online communities from China, found that brand-consumer attachment has a complete role of moderator between full commitment to their community and their commitment and also partially mediate between brand identity and brand commitment. Fong Su et al. in 2013 on the assessment of the effect of identifying customer brand loyalty investigated Brand Hotels and loyalty development. Hotel industry is rapidly realizing that branding strategies forming a strategic weapon in order to secure the industry's competitive environment. To develop current understanding of the hotel brand management, this research identified the role of brand identification by the customers to customer loyalty formation.





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**Research Hypotheses**

1. The reliability has a direct impact on brand credibility of imported products.
2. Reliability Brands of imported products has a direct impact on internal customer loyalty.
3. The perceived quality of imported products has a direct impact on the credibility of their brands.
4. The perceived quality of imported products has direct impact on customer loyalty.
5. Nationalistic Sentiment adjusts the relationships between the factors affecting the credibility of the brand and customer loyalty.

**METHODOLOGY**

The methodology used in this study was descriptive- correlational research with causal approach and in terms of purpose was regarded as practical research

**The population, the sampling method and sample size**

The study population includes all costumers of Appliance Co., Daya Group's in Iran. In this study, in order to generalize the results of sample to the entire population and the description nature of research, systematic random sampling method is used. Because the population is infinite and the unknown, the samples were selected using the Morgan-krejcie table. Accordingly, the sample size was calculated 384.

**Data collection tools**

In The library method, the note taking tool and in the field method, the questionnaire tool was used. Questionnaire was standard and was extracted, translated and modified from the past valid studies. Questionnaire is a common research tool and a direct method for obtaining the data. Questionnaire is a set of questions (items) that the respondent provides thoughtful responses by considering them. The answer forms the researchers need to data. Question of the questionnaire can be considered as a stimulus for response. Via The question of the questionnaire, knowledge, interests, attitudes and beliefs of individuals could be evaluated to find his/her previous experiments and to be aware of what he is already done. 1 -5 scale Likert questionnaire was used to design the closed form of questions. Generally Likert scale has several advantages rather than the other scale because it does not require a lot of questions, not the judge of experts and yet the results are more accurate and reliable. Therefore, this scale is applicable for a wide range of research in the social sciences, especially sociology and can be used by a variety of its issues (political orientation, religion, race, occupation, etc.) to be evaluated. In this study, using this scale, a range of variables in the form of questionnaire were designed and presented for the respondents.

**Validity and reliability of the study**

In this research to assess the validity of questionnaire, the content validity is used and to ensure from the validity of the research, the questionnaire was examined by professors (experts) and after its modification by certified experts, the final questionnaire was prepared. In this study, to evaluate the reliability, the internal consistency (Cronbach's alpha) was used. Based on the verification method, Cronbach's alpha coefficient was equal to 0.86. Its value is more than 7.0 and in an acceptable level. The Cronbach's alpha coefficients were estimated for each of the research variables and showed the appropriate reliability for them.



**Vali Allah Berangi et al.****Data Analysis Method**

To prepare data for analysis, they should be classified. In quality research this work is easy because at the time of data collection the questions are usually classified while in qualitative research it can be more difficult. However, before analysis, the data should be sorted and classified. The collected data can be analyzed manually or by computer. If the data volume is much greater than a certain amount, the manual analysis is not possible. Today, in almost all cases, the analysis is performed using various computer applications and statistical analysis.

The main statistical software used in educational, social, medical research group is spss software. Two main processing mainly are performed on data in different studies. For this aim, the descriptive statistics and inferential statistics are used. The descriptive statistics is used to describe the data that usually deals with central tendency and dispersion of data will be used for expression of collected data. To display and demonstrate the results, the tables of usually frequency – the absolute and relative numbers, different graphs and histograms such as bar or circle are used. Also in this field, the dispersion parameters such as variance, standard deviation, and standard deviation is also noteworthy. Inferential statistics test the studied hypothesis in the paper. Different tests such as chi-square test, t - test, regression, analysis of variance, and etc. are used in this context.

In this study, first, we examined the characteristics of the target population and then evaluate the research hypotheses using descriptive statistics and inferential statistics. In this context, structural equation modeling approach is used to analyze models with good fit. LISREL software will be used to implement this method. This is when the use of parametric statistics condition is allowable; otherwise the partial least squares method is used.

**RESEARCH FINDINGS**

According to the data obtained from the questionnaires, 33.3% of the respondents were male and 66.7% were women. These results can be interpreted in the way that women are more likely to take care of household appliances. The age composition of the respondents is as follows: 25.6% of respondents aged between 20 and 30 years, 44.2% aged between 31 and 41 years, 25% between 42 to 52 years and 5.2% were above 52 years of age. Among the range of 31 to 41 years accounted for the largest percentage of respondents in this study. 30.5% of the respondents in this research had diploma degree, 43% had BSc degree, and 26.6% had MSc degree while nobody had PhD degree. 41.9% were familiar with this company for 1 to 3 years, 30.5% for 3 to 5 years, 19% for 5 to 7 years, 6.6% for 7 to 9 years and 2.1% more than 9 years.

**Test hypotheses**

In this study, structural equation modeling is used to examine the construct validity of the test result and also hypothesis research results. A total of confirmatory factor analysis (measurement model) and the structural modelling are used. At first confirmatory factor analysis was performed on the main questions, and then the structural analysis was performed to test influence of the dependent variable on dependent variables to test the assumptions of research.

The results of the measurements are reported in Table 1. Items with loadings less than 0.5 were removed and not participated in the structural model. Given the values of factor loadings and internal consistency of items, Construct validity of each of these items is approved and indicates that each of the variables is measured well.



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Table 2 shows the results of the structural model to test the hypothesis. According to the values presented in this table, when the significance number was higher than 1.96 or less than -1.96 and the amount of error (P-Value) is more than 0.05, then the hypothesis is confirmed. Thus, according to the results shown in the table, except for hypotheses 1, 2 and 4, the other hypotheses are approved.

According to the results of the structural model, the reliability is not directly related to brand credibility and brand loyalty. It does not mean that this variable has no effect on them but it is possible to have effect through the other variables or have a moderator role. The impact of perceived quality on customer loyalty through brand credibility is significant. This shows the perceived quality has a moderator role between perceived quality and customer loyalty. This rule also applies to the perceived value and perceived quality results for this variable are also consistent. Purpose or hypothesis (5) of the study is the investigation of the mediating role of nationalistic feelings in the relationship between the factors affecting the credibility of the brand and customer loyalty in imported products. Cohen and Cohen (1986) model has been used to test this hypothesis. According to this model, the direct effect of the independent variable on the dependent variable, the direct effect of moderator variable on the dependent one and finally the cooperative effect of independent and moderator variable on the dependent variable was analyzed. The results are reported in Table 3. Therefore, the obtained results indicated the sense of nationalism variable has mediating role in perceived quality and brand credibility.

**RESULT AND DISCUSSION**

First hypothesis: The reliability has a direct impact on brand credibility of imported products. According to the statistical data of this hypothesis, the hypothesis with significant number of 1.281 and the standard level of 0.068 was not accepted, then the reliability of the customers to the brand have not a direct impact on brand credibility and it can be said that it has the indirect effect. The second hypothesis: Reliability Brands of imported products has a direct impact on internal customer loyalty: The second hypothesis with a significance level of -0.981 and the standard level of -0.145 was not confirmed as the first hypothesis. The trust capability could not effect on brand credibility and also customer loyalty. Third hypothesis: The perceived quality of imported products has a direct impact on the credibility of their brands. This hypothesis was confirmed with significance level of 4.764 and standard coefficient of 0.408. In other words, the quality of imported products perceived by the customer has direct effect on the brand credibility in customer viewpoint. The fourth hypothesis: The perceived quality of imported products has direct impact on customer loyalty. This assumption was rejected with significance level of -1.021 and standard coefficient of -0.072. One of the major ways by which a service firm can differentiate itself from its competitors, is always provide superior quality services to the customers to obtain the customer loyalty. The fifth hypothesis: Nationalistic Sentiment adjusts the relationships between the factors affecting the credibility of the brand and customer loyalty. Cohen and Cohen (1986) model has been used to test this hypothesis. According to this model, the direct effect of the independent variable on the dependent variable, the direct effect of moderator variable on the dependent one and finally the cooperative effect of independent and moderator variable on the dependent variable was analyzed. The fifth hypothesis has a sub-hypothesis states that states the nationalist sentiments has moderator effect on the relationships between perceived quality and brand credibility. This hypothesis was confirmed at a significance level of 3.425 and standard coefficient of 0.34.

This hypothesis suggests that strengthening or weakening of the effect of the perceived quality on the credit depends on the nationalism sentiment. There is evidence that some consumers (especially in more developed countries) due to feelings of love and loyalty to their country, or because the perceived quality of domestic products prefer to purchase the domestic products. Marketers' attention to the role of nationalism in consumer behavior leads to the formation of nationalism theory. As consumers that have no tendency to nationalism select foreign products based on price, quality and other favorable characteristics, the nationalism consumers criteria is the national economy losses associated with the purchase of this product.

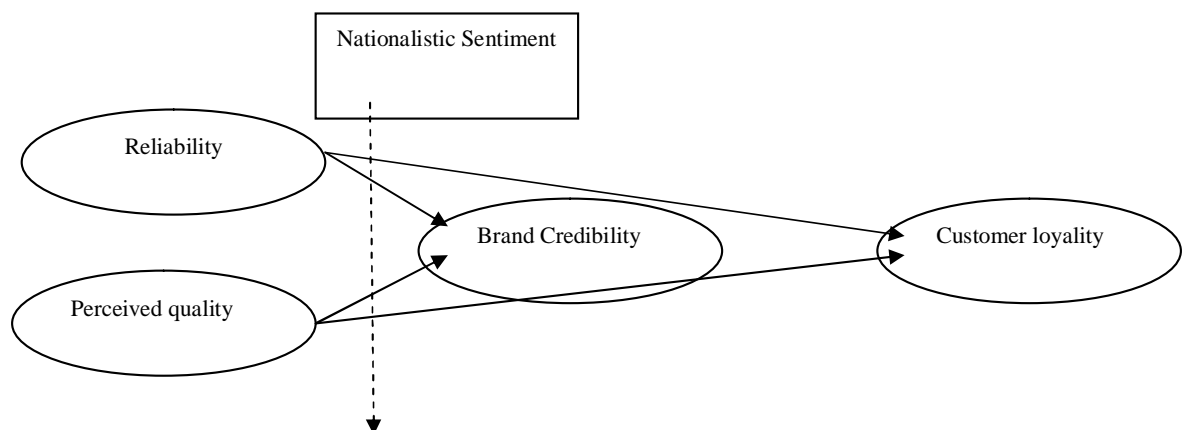




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**Diagram 1: Structural diagram of the research**





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**Table 1. The results of the measurement model and the structural model of the research**

| <b>Variables</b>              | <b>Questions</b> | <b>Factor loadings</b> | <b>Cronbach alpha</b> |
|-------------------------------|------------------|------------------------|-----------------------|
| <b>Reliability</b>            | Question no. 1   | .715                   | 0.83                  |
|                               | Question no. 2   | .824                   |                       |
|                               | Question no. 3   | .671                   |                       |
|                               | Question no. 4   | .634                   |                       |
|                               | Question no. 5   | .733                   |                       |
|                               | Question no. 6   | <b>.446</b>            |                       |
| <b>Perceived quality</b>      | Question no. 7   | .734                   | 0.79                  |
|                               | Question no. 8   | .758                   |                       |
|                               | Question no. 9   | .667                   |                       |
|                               | Question no. 10  | .755                   |                       |
|                               | Question no. 11  | .742                   |                       |
|                               | Question no. 12  | .795                   |                       |
| <b>Brand credibility</b>      | Question no. 13  | .816                   | 0.74                  |
|                               | Question no. 14  | .841                   |                       |
|                               | Question no. 15  | .774                   |                       |
|                               | Question no. 16  | .845                   |                       |
|                               | Question no. 17  | .552                   |                       |
|                               | Question no. 18  | .648                   |                       |
| <b>Nationalist sentiments</b> | Question no. 19  | .630                   | 0.86                  |
|                               | Question no. 20  | .712                   |                       |
|                               | Question no. 21  | .696                   |                       |
|                               | Question no. 22  | <b>.335</b>            |                       |
|                               | Question no. 23  | .764                   |                       |
| <b>Attitudinal loyalty</b>    | Question no. 24  | .860                   | 0.88                  |
|                               | Question no. 25  | .756                   |                       |
|                               | Question no. 26  | .768                   |                       |
| <b>Behavioral loyalty</b>     | Question no. 27  | .720                   |                       |
|                               | Question no. 28  | .598                   |                       |
|                               | Question no. 29  | .782                   |                       |







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**Table 2: Standard coefficient and significance numbers for the research hypotheses**

| Hypothesis   | Path              |        | Standard coefficient | Significance number | Hypothesis Result |           |
|--------------|-------------------|--------|----------------------|---------------------|-------------------|-----------|
| Hypothesis 1 | Reliability       | -----< | Brand credibility    | 0.068               | 1.281             | Rejected  |
| Hypothesis 2 | Reliability       | -----< | Customer loyalty     | -0.145              | -0.981            | Rejected  |
| Hypothesis 3 | Perceived quality | -----< | Brand credibility    | 0.409               | 4.764             | Confirmed |
| Hypothesis 4 | Perceived quality | -----< | Customer loyalty     | -0.072              | -1.021            | Rejected  |

**Table 3: Nationalism sentiment mediating role test**

| Factor | Path                          |                   | Standard coefficient | Significance number | Hypothesis Result |
|--------|-------------------------------|-------------------|----------------------|---------------------|-------------------|
| 1      | Nationalism/Perceived quality | Brand credibility | 0.34                 | 3.425               | Confirmed         |





## Designing Entrance and Exit Registration Machine for RFID Systems

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Received: 20 Mar 2015

Revised: 18 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

The purpose of this paper is to design an electronic circuit for registration of presence and absence in RFID systems. RFID systems are one of the effective technologies in this field that can be a proper alternative to barcode and magnetic systems. Proteus software is used for PCB design. After identifying the target ID, the central unit stores it in memory and sends user's ID to monitoring section. Compiler version 2007 is used for coding the microcontrollers.

**Key words:** Entrance, Exit Status, Microcontroller, Proteus Software, System RFID;

### INTRODUCTION

Due to the importance of research in the field of specialized softwares, computer science has revealed its extensive application through showing simple and useful examples. One of the applications is traffic control software that covers a wide range of procedures (Abrial et al., 1996).

After 70s, the growth of information technology has accelerated with a wonderful speed; it reached its climax in the final decade of the twentieth century, which resulted in a phenomenon called information revolution. In the course of evolution, data processing age (1950-70) and management information system (MIS) age (1970-90) had passed; then, it entered a more essential age after 1991. The most important factor in the emergence of something called knowledge management is increasingly rapid progress of information technology and its increasing interaction with management concepts. Given the slow process of maturity in organizations, enterprises, and industrial and service sectors in developing and the third world countries in recent years, a challenge emerged in various economic, social



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and industrial fields. Most of these countries have tried to solve the problem that is called digital divide. It is obvious that the success achieved in these countries is due to the detailed studies and feasibility and principal investments in the countries (Smith et al., 2000).

Traffic control in large areas is one of the providing components of order and security. Calculation of working time and calculation of wages are other qualities that draw attentions to presence and absence machines in recent years. These technologies are generally classified in the class of traffic control systems because they have common planning system (Bjørner, 1997–1998). Several technologies are designed to improve entry and exit control system. Using cards, entering ID numbers such as personnel ID, using pictorial analysis, and using finger points are examples of these technologies. The fingerprint method has more functionality than the other techniques. Losing cards, forgetting ID numbers, or entering wrong numbers are weak points of these methods. The fingerprint method has a high capacity that the uniqueness of prints is one of them (Feng, 2007). One of the important issues in this regard is selection of an appropriate program and algorithm to carry out the process. Cryptographic technique is one of the most known techniques. There are some secure techniques such as AES and RSA. Safety of the technique means that the print is devoted to only one person. In this case, the pictorial analysis of fingerprint plays an important role. Passcode may be forgotten at any time; but these biometric features are always available for users (Nandakumar et al., 2007). Designing an appropriate algorithm is an essential point to make a compiled program and construct a useful system for proper control. Figure 1 shows a general algorithm to check the biometric parameters.

Another of identification model of presence and absence is identification through the voice of people. The human ear is a complete sample to identify individuals; it allows managers to provide a security area at public places like universities and organizations (Iamarelli, 1989). Several developed systems have been designed to identify persons by using three-dimensional and two-dimensional images. The geometric properties of images taken from the ear of people are used in many of these systems. In these Methods, they take an image from person's ears, and then they draw the line that connects two points of the ears and the longest axis. Then, they draw a line forming a certain angle of the major axis. Using parallel lines, they construct a geometric image that is applicable in mathematical softwares for obtaining a numerical code. The numerical code can be used as an identifier for the person (Burge and Burger, 2000; Michał et al., 2006; Dasari and Gupta, 2006; Hurley, 2000). Referred cases are classified according to the identified organ, but the important point is the technique employed in each of the cases. Radio frequency identification (RFID) is one of these technologies. This technology is not a new emerging one. This technology has been proven in the mid sixties to detect aircraft in military industries (Parliamentary Office of Science and Technology, 2004). Commercial application of this technology emerged in industries in the eighties. Of course, it should be noted that business applications of the technology could not be used widely in industry due to its high cost. This technology can be applied in very small pieces in single industries to save the serial number for each product type (RFID Journal, 2010). Replacement of this technology with magnetic cards and bar codes is on the rise and its application can help managers to identify various objects or multiple items simultaneously. In addition, RFID does not require employment of laser scanning and it is just enough to pass the product label or given segment under the radar area of system to allow the machine to read it (Gareth, 2007). The part that transmits the data to the reader is called tag. Moreover, another feature of this technology is its capability that allows the managers to adjust the identification range of technology from a few centimeters to several hundred meters. These systems consist of two components; the first component includes the tags and tag readers. The second component is computer software that coordinates the components and collects data. Nowadays, tags are placed on intended parts and they vary in size depending on intended field. Each tag can save up 2 kb of data. Tags contain an antenna and a microchip. They are classified into two different groups: first, active tag that requires a battery and inactive tag that does not need energy (VidTroni, 2010). On the other hand, the radar, which is another component of the system, consists of a transmitter and a receiver.





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In this project, the researcher intends to design an entry and exit registration machine. Since the project has two parts, central part and monitoring part, the designed circuit is generally divided into two parts; the connection between the two parts are available by two wires. After identifying target ID, the central unit saves it in the memory and sends user ID to the monitoring unit. The researcher uses a RFID module that has the capacity to read only on cards. Because there is no need to save data in this particular project, the task of computer program is only to receive data from individuals and implement them. It is not accomplished just by programs and researcher needs a decoder or decipherer to receive data and produce and manage suitable voltages for driving other parts. Microcontrollers can be applied for this purpose. In fact, a microcontroller is a single-chip computer with cheap price. A single-chip computer means that the entire system of computer is embedded inside an integrated circuit chip. The microcontroller constructed on silicon chip has the same features as standard personal computers. The first feature of a microcontroller is its capability to save and run programs (which is its most important feature). Microcontroller has a CPU (central processing unit), RAM memory, ROM memory, I/O line (input lines and output) ports, Series and parallel ports, and timers. It may sometimes have some additional equipment like A/D converter (analog to digital converter, or the A2D) and D/A converter (digital-to-analog converter). In monitoring unit, a high capacity memory is needed to store images. The best solution is using the type of RAMs known as MMC. The communication Protel in these memory cards (RAMs) is SPI in which the connection with microcontroller is established by four wires. AVR DOS is used in this regard. The researcher uses BASCOM-AVR compiler in this research. BASCOM-AVR compiler does not have the functions needed to establish the connection between the micro and the LCD. It should be implemented using a set of functions in different subroutines.

## EXPERIMENTS AND RESULTS

### Circuit Design

Proteus software is used for designing the circuit. The researcher has also used AVR microcontrollers produced in ATMEL Company. Color screen used in this project has 37 bases. There are two methods for testing the performance of any electronic circuit: the first method is to close the circuit and the second method uses available softwares. Proteus software is used for circuit design. Figure 2 shows the circuit scheme of monitoring unit in this research. As it is observed, memory card in this circuit is connected to micro by four wires. N98 color screen is attached to the micro with 21 bases; 16 bases of the 21 bases relate to data-bass and other five bases relate to LCD control bases. The rest four bases of the color screen relate to LCD touchscreen. Figure 3 shows ISIS Professional area.

Figure 4 shows the scheme of central circuit. As it is seen in this circuit, three keys are designed in the circuit for time adjustment, reading, and clearing the memory. The connection between RFID module and available microcontroller in the circuit is established in series with two wires. Character screen of the circuit shows time, date, device messages, and other information.

Figure 5 shows a view of a 4-channel oscilloscope in Proteus simulator; it is used for observing waveforms and measuring voltage, time, frequency, and phase differences.

We can design and implement the decoder circuit by using the decoder ICs of ASCII characters and shift register chips, but the microcontrollers are inexpensive computers.

The unique capacity of storage and implementation of programs lead microcontrollers to be very flexible. For instance, one can program microcontrollers in such a way that decide (do desired operation) based on predetermined conditions (the status of input and output lines).



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Microcontrollers are coding through their special programs because, at first, they have 8-bit CPUs and do not run under Windows, and second, they have flash memory in the range of kilobytes. Their executable programs should be loaded in compressed and particular formats.

Therefore, for coding microcontrollers, the researcher requires a compiler that on the one hand is simple, and on the other hand has enough power to perform determined orders. BASCOM-AVR is an IDE compact environment. IDE means that the entire program is like a single window, other sub-programs like simulator, programmer ... open in this window, and all are subject to the same pattern as the compact environment.

The researcher uses version 2007 of this compiler for designing. The numbers of pulses of the previous block are counted by an 8051 microcontroller model 89C52. The microcontroller has three internal timers; for using them, it is just necessary to active Timers in Code Version simply through Wiozard.

Printed circuit board (PCB) is one of the most important parts of any project. Basically, there are two ideas for communication between components of a system. First, one can connect all individual parts to others by separate wires; this method is used mostly to test and verify the performance of the designed parts by wires and props. Second, all components can be placed on a common bus or passage; this method is used at the time of testing semi-advanced circuits on breadboard in the laboratory.

In fact, the second method is more scientific. As it is often observed, using wire and prop in laboratories causes burning of the components, connection between the wires, and lack of performance due to the influence of immense and turbulent wires together. These effects cannot be ignored in practical models of circuits. In addition, using long wires increases circuit resistance and leads to enhancement in the cost of manufacturing as well as reduction of quality and the circuit's positive performance. The second project, using a shared passage, is approved by the public; all sensitive computer circuits are produced according to this method of design and implementation. The printed circuit of the board used in this research is developed with PROTEL 99 SE software. PROTEL program is one of the most powerful PCB design applications and its DXP 2004 version includes all bases and ICs available in the market. Protel 99 is used to design this part; a view of this is seen in figure 6

The designer has tried in this circuit to shorten all lines as much as necessary to prevent the noise on the circuit as much as possible. As it is observed in figure 5, the designer has tried to place input power terminals and wires next to PBC; in this case, they are easier to access and can be easily used. Moreover, placing terminals next to PBC enables the researcher to connect various devices of same type easily to each other and implement a greater project without observing a small crowd in the entire series. Figure 7 shows the output from application of protel. Figure 8 shows the placement of components on printed circuit boards

**CONCLUSION**

This article reviews the design of a circuit for individuals' presence and absence using RFID technology. The obtained data show that circuit design technique for these systems are convenient and low cost.

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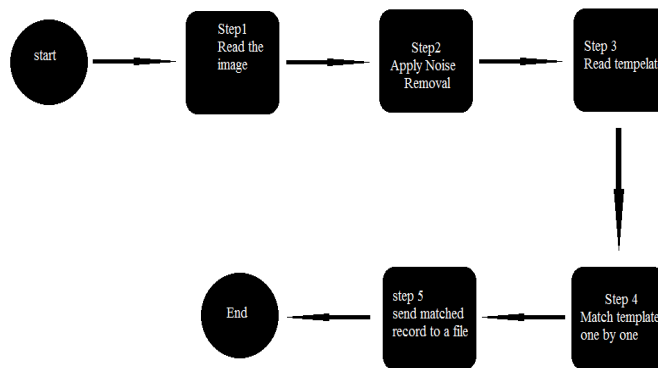
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**Figure 1: A general algorithm to check the biometric parameters**





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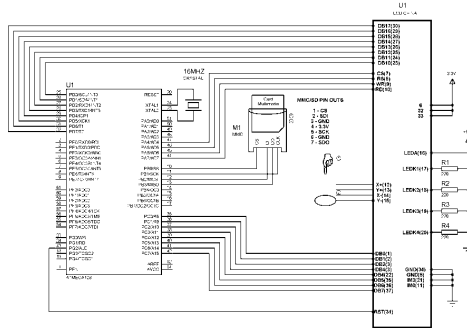


Figure 2: scheme of the circuit

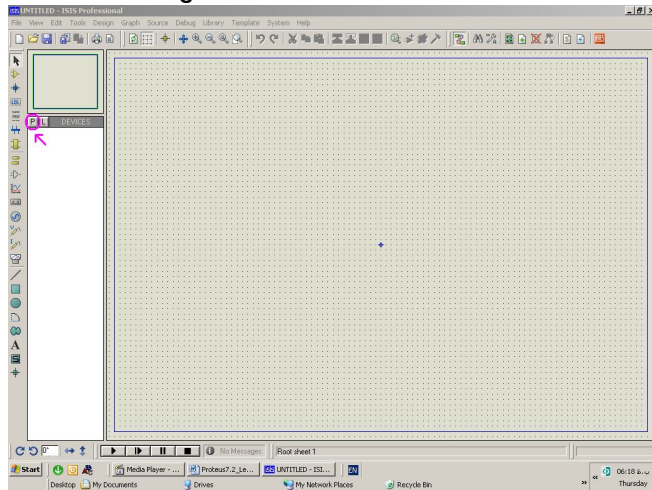


Figure 3: ISIS Professional area

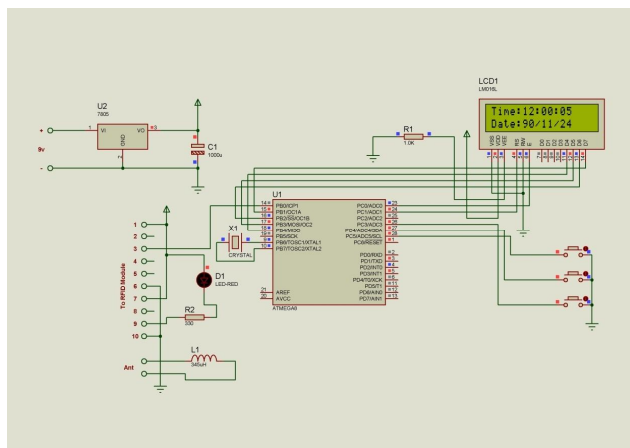


Figure 4: Scheme of central circuit





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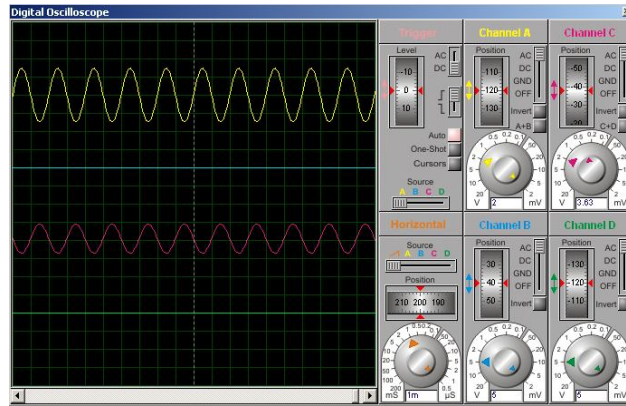


Figure 5: Perspective of a 4-channel oscilloscope in Proteus simulator

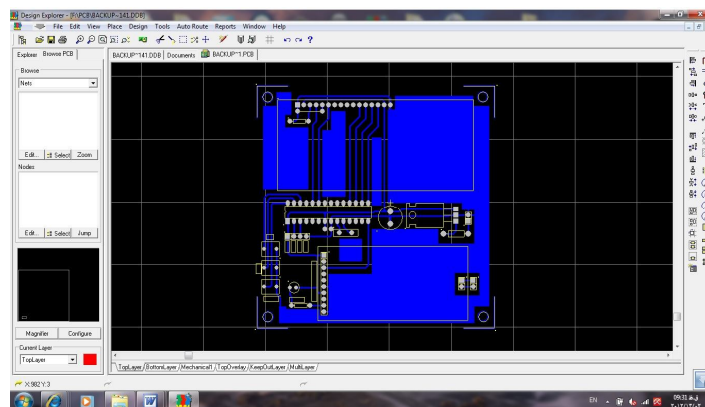


Figure 6: PROTEL 99 SE

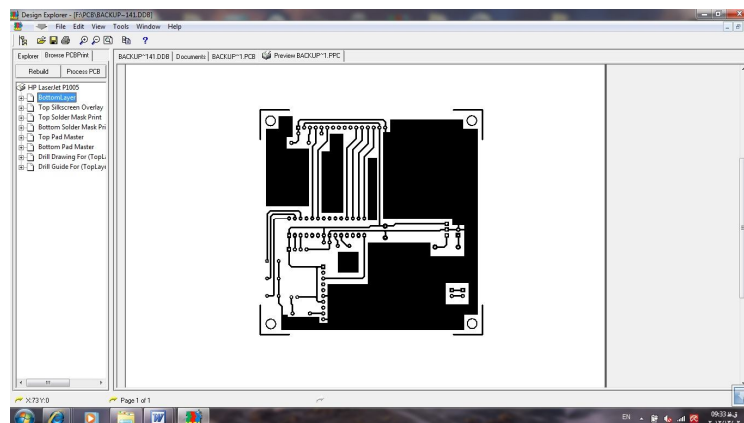


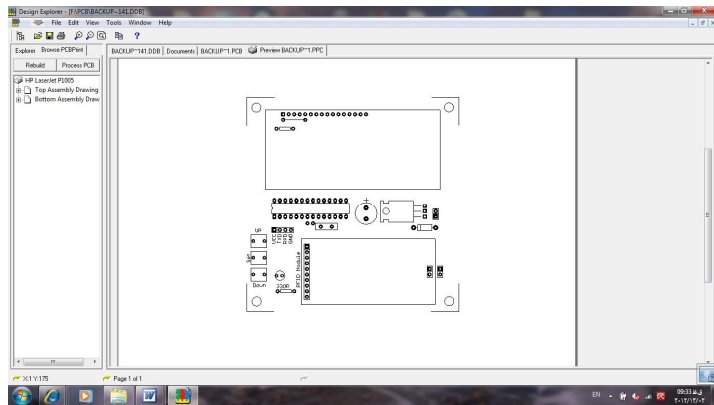
Figure 7: Protel output







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**Figure 8: PCB layout**





## The Effect of Media Representation of Crime on the Proceedings in Criminal Prosecution; with Emphasis on the Cases of "Old Hyena"

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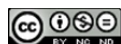
Received: 20 Mar 2015

Revised: 24 Apr 2015

Accepted: 30May 2015

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### ABSTRACT

There are many ideas about the effect of media representation of criminal cases on the process of their investigation. The growing trend of media and virtual social networks have accelerated crime news and influenced on criminal justice bodies. This article tries to investigate deeply a criminal cases represented on media about child abuse, kidnapping, deliberate physical injury, and forcible indecent behavior; it studies the effect of its media representation on the process of criminal prosecution. In other words, it seeks to find the violations of rights occurred in this regard. It decides to clarify the effect of representation on the ways judges deal with the case. In the case of negative effects, the article tries to offer appropriate solutions for a fair deal and away from the media chaos.

This is a descriptive-analytical research. Interviews with some aware persons such as judges, lawyers and journalists to gather data about the case of "Old Henya". It seems that media representation influences on the process of their proceedings in the prosecution; they influence on some issues such as retribution, emotional atmosphere, reference to legally invalid evidence, and lack of observing defensive rights of the accused.

**Key words:** media representation, old hyena, criminal procedures, emotional discourse.





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## INTRODUCTION

Increasing representation of criminal news on media have frightened people of crimes more than usual; this fear has led them to think that they are living in a world full of chaos and violence. In this regard, they will hate any sort of offense and it paves the grounds for people's distrust of the police and judicial system.

Media are always showing a crime as a terrible disaster, an offender as a giant, and a victim as an angel. This illustration causes people's severe opposition to crimes; thus, they may call for speedy and public trials and serious dealing with the perpetrators of these crimes to reduce the chaos. Hence, they may pressure on penal justice system in order to achieve their goals and desires.

Media select some offenses based on subjects like crime, the victim or offender, represent them in their reports, and increase people's information by describing criminal events and repeating their news, in this manner, public opinion prejudice penalty, the investigation and execution of those crimes. On the one hand, this may be in favor of social security, the accused and the victim because media pressure on the state by these disclosures to react properly in the cases of severe violation of norms and serious crimes. On the other hand, media representation and the dominance of criminal populism can have negative effect on the rights of some individuals, especially the rights of accused. For instance, many of the accused's defensive rights may not be observed in this regard.

The news media often seek to reflect the realities of their social and cultural organizations rather than to represent the reality of the events. Increasing the number of news services, various information networks, and their privatization have led managers to seek more audience and pay no attention to the impact of the news they are represented; they try to engage more audiences' emotions and ignore showing criminological analyses and scientific interviews on the subject.

This article tries to explain cases that have been under the influence of media representation in process of investigation. The proposed ideas are based on the studies about the case of "Old Henya" that have represents widely on media and the representation influences on the process of investigation the case.

### **The Impact of the Emotional Space of the Proceedings**

Last year, news on the persecution of about 60 girls in Mashhad released by newspapers and news sites that hurts public spirit as understanding some instances of crime does not need arguments and every people rejects such actions. In addition, videos of extortion by some offenders in the most watched news in Iran have raised wonder, pity and hatred of public opinion. No doubt, watching this scene hurt the conscience of every human being. Fortunately, a few nights later, the news of arresting the offender shows the efforts of police and security authorities in this regard, this is honorable in its own turn.

However, it is better to examine the news from the hidden perspectives:

"Penal populism" is a relatively new issues raised in criminal sociology. This issue is proposed when public opinion is strongly stimulated towards a specific criminal offense and calls for an intense and hard dealing with this. When social emotion is stimulated, the judiciary and security forces will be under pressure of public opinion to amend the subject and show a severe reaction in this regard. In the other words, the necessity of revenge and reaction will saturate social space and criminal justice system tries to fulfill this public request by showing a severe reaction. It must be understood that justice is the first victim of this atmosphere because social desire will not be satisfied by the available rules and if the judge execute the law based on his conscientiousness, public opinion will accused him of





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collusion, inefficiency or neglecting social request. Indeed, some parts of society look at judicial system as if a restaurant that is obliged to offer services for their desires and the food should be suited the customer. Meantime, legal and judicial standards should be violated to raise the admiration of public opinion. Being under the influence of atmosphere is a deficiency of judicial system. Judiciary and noble judges should not be under the pressure of social emotions. The judges need quiet spaces to investigate a case by legal standards and judicial conscience. Judiciary is not a tailor to sew clothes on order because this lead to a chaos.

In this situation, the impact of external factors, especially the public media, has a significant role in public opinion to have a pessimistic view. On the one hand, by promotion and dissemination of specific opinions, media has a key role in shaping perceptions of many people and leads them to select a specific perspective. On the other hand, by guiding public opinion towards their favorite, politicians also try to channel it. For example, in the interviews released in the Events of the Khorasan newspaper, the released news about the “Old Henya” were under the control of authorities of the case and their ideas about the case have been included in the news; this perspective is seen in the hegemony of repressive regimes. Thus, a critical approach is growing about policymaking based on the results of public opinion polls; it emphasizes that instead of being reasonable ideas of informed member of society, public opinion is mostly a set of comments of people that are under the influence of actors who are called “opinion leaders.”

In the case of Old Henya, the pressure of opinion on criminal procedure have been so intense that judicial authorities have reacted because by attaching the SMSs send by people to the case, the coroner has been informed of the public responses and has been naturally influenced by people’s request. It is natural if the judges show a response to satisfy the demands of people. Nevertheless, the authorities may show reflections that do not sataisfy people’s demand; such as a case called “Bleck Scorpion”. In the latter case, the defendant was sentenced to death in the first trial; but he was was acquitted at the second trial. After the news of the acquittal, media and people protested so much that the country’s highest judicial authority ordered to kill the accused at your own responsibility. This reaction shows extreme pressure of public opinion on judges and supreme officials of the court; this may be the reason for sentencing Black Scorpion to death in third trial.

In the case of Old Henya, the pressure of media and public opinion was so intense that the magistrate matched the accused’s behavior to a crime whose punishment satisfy the public desire regardless of lack of legal clarity. Otherwise, the justice system would be accused and it would be regarded as the main accused that should accept the responsibilities of uncertainty, inefficiency, injustice, slackening and tolerance. Therefore, opposition to the populist policies is regarded as opposition to the interests of the majority of society; it is censored condemned and vilified.

Since public opinion does not have legal information, it encounters represented crimes emotionally and shows intense reactions as this case. There are some SMSs sent to the officials by public opinion:

1. Death sentence must be issued quickly for city’s hyena and he must disappear from the earth.
2. Mr. Attorney! Death by hanging is a pity for the hyena, only stoning!
3. The main reason for rise of hyenas and scorpions and bats, especially in the holy city of Mashhad, is appeasement, lack of decisiveness and required dealing by the judiciary.
4. Stoning and executions of such henya might be remedy to the hearts of families.
5. Hyena of the city should be executed in public as soon as possible.
6. Apparently, hyena case is stuck in maze of administrative bureaucracy, unless even one second is late; execute the damned evil and do not allow the burial in Muslim cemeteries.
7. I ask the judiciary to execute the evil old man.

Such expressions indicate their demands for the maximum punishment of the accused regardless of its legal penalty. Nevertheless, to get closer to justice and to avoid lawlessness judiciary should try to reduce their emotional



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atmosphere and convince the public for appropriate, fair and lawful treatment of offenders to avoid violation of rights of the accused due to hasty or emotional decisions.

In many cases, if one looks closely to the views of people, it is clear that media and politicians have led public ideas and direct them in their own favor. What are known as the strict policy of the people are indeed the opinions of policymakers who have inculcated them in people's brain. Hence, it is necessary to get the real view of people about the subjects of the criminal justice system at first. Criminal Populism has led public sentiment to be used for political interests. This idea is greatly similar with Bottoms's idea about populist crackdown. For him, politicians take the advantages of populist crackdown for their own purposes. They ratify and implement public criminal ideas in the name of accountability to public concerns.

The sovereignty of emotional and political approach to the scientific approach is emerged even in the legislative process; it causes the policies in line with the views of policy makers to be adopted easily while inconsistent policies have little chance for the project in spite of their scientific grounds. This approach is seen in the recent eras of Parliament. For instance, Seventh session of Parliament adopted plans and bills such as "A bill amending the law on how to punish those who are illegally in audiovisual activities," "Plan of the ban on companies and institutions with a pyramidal structure or endless network," "The amendment of Article 188 of the Criminal Procedure Code," and "Bill of incorporating a clause in the penal code on how to monitor experienced offenders." However, plans and bills such as "Drug control decriminalization bill of law," "Bill to prevent crime" and "Bill of economic sanctions to replace prison" that have been developed by scientific institutions like the Center for judicial development of the judiciary based on scientific findings have not been approved, yet.

The trace of sovereignty of emotional and political approach to the scientific approach in the eighth Parliament is reflected in the adaptation of "The intensification of the fight against violent crime." This plan was proposed to the Parliament after several murders in July 2011, the murder of a girl student by his classmates on the bridge of Modiriya, and the murder of the strongest men's champion in Karaj. Media have widely propagated on the subject of violent crimes and state that these crimes hampered social security seriously and severe reaction has become a public demand.

After the occurrence of these events, Parliament tried to respond to what have been called public demands by mass media. The deficiency of such bills relates to the severe influences on them due to emotional and media atmosphere and the lack of scientific evaluation. Experience has shown that such summarily projects can have little effect in the prevention of similar incidents due to the lack of comprehensive view.

Moreover, there should be a difference between security and sense of security. The first is rooted in social reality and one should refer to social elements that create or remove security and explore them for real (having security or lack security). Whether the citizens live in an atmosphere free of intimidation and fear and chaos or the society is full of elements that destroy citizens' security. A sense of security does not discuss the community, social space and outer reality. Sense of security is a mental status concerning the citizens' emotion about security. There is no correlation between security and sense of security. Society may not be safe, but society is full of sense of security. Media play a key role in this regard. In other words, a safe society may be full of sense of insecurities. The mistake have been made by media in this type of child abuse and forcible indecent behaviors have damaged this social capital, or sense of security. Certainly, slogans such as "knowing is the right of people," the "social realities should be represented" and "media is the spokesman of nation" are true in their own place; but they should not be used as tools destroy a more important subject. In other words, national atmosphere should not be represented insecure to fix a specific problem and a minor case. In this manner, citizens will fear on the one hand; security forces fall in increasing trouble and they will be disapproved by offenders. Showing these scenes in front of people in the news or detailed representation of news on the cases and crimes of an accused in newspapers indicate exaggeration and emotional space. The damage



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imposed on public trust and public emotions by this condition will not be amended easily. This issue should be observed not only by national media but also by all media and social networks. In response to the researcher about the ways the case of Old Henya affect him, one of the judges said that I was impressed by the news on this case as a citizen who acts in our legal system for some years; this may happen to every individual, even my own children. Therefore, we should be very careful. After this event, I was very careful about the security of my children, especially in their way to school.

When a judge, who has faced many child abuse cases during his judging career and he should cope with such crimes in society, is so distracted, this anxiety, fear and feelings of insecurity among the general public will be much more intense.

In addition, representation of arresting the suspects in the case of so-called "violent extortion" in news by specifying that the operation was carried out at two o'clock after midnight and the news about the arrest of Old Henya in his house titled as "Hyena was hunted in its nest" in newspapers and websites are also interesting. In the representation of such scenes, or reflect the news about the arrest of the suspects, media intentionally or unintentionally intensify the sense of insecurity; it makes the issue a subject for all the Iranians around the country. Whether it is good for the country to intensify the sense of insecurity. Of course, nobody is agreeing to neglect crimes, reports to the authorities and pursuing them; but heightening insecurity is questioned.

Where is the purpose of such pictures and news? First, they hurt society and remove sense of security; then, they suggest that the suspects have been arrested and they will be punished. In addition, they poll from people about type and ways to punish these offenders, or if people announce their ideas about offenders and their penalties without polls, then the ideas will ne included in judicial proceedings. It is interesting that people determine punishments with an admirable confidence and proud, request maximum penalty and death! Is the common people in the streets have studied law to determine the penalties and legal authorities refer to them in their decisions, determination of penalties, and issuance of a sentence? Is religion and law allowing such expressions to lay people?

Emotional atmosphere and fears have forced supreme legal authorities to show reactions in many cases; this reaction may not be seen in other cases that have not been represented on media. For instance, in the recent extortion case, Head of the Judiciary asserted in national media that according to Sharia and law, there is no difference between using cold weapons and warm weapons and committing this is definitely moharebeh; in fiqh, it punishment is death; however, there are other alternatives in this regard. Nevertheless, the judicial system has chosen death penalty due to the necessity of raising the cost of evil acts and decisive encounter. In this statement, both issuance of sentence and implementation of rule on specific issues as well as selection of a specific punishment from the four penalties. However, according to the second paragraph of Article 183 and Article 617 of Islamic Penal Code, any extortion is not war against God; it seems that the Head have not paid attention to spiritual element of moharebeh or public intimidation. This issue has been argued by many great jurists so that they focus on distinction between initial intention and secondary intention. Beyond scientific concerns, it is not expected from the Head of Judiciary to comment on partial details in a case. Is there any reason rather than the effect of emotional atmosphere on the society and its representation? An informed person in judicial system of Iran knows well that there are many extortions in every day in the country, which may be more dangerous and more violent than the recent case; but rarely are the unrepresented proceeding results in death sentence under the title of "moharebeh" or War against God". Although supreme judicial authorities have not entered in the case of Old Henya, the crackdown of an action that has no direct reference in the law seems to be more under the influence of case representation and emotional space. Sometimes, the dominant feature of public opinion, especially after the events of the crime, is angry and revengeful feelings. In this case, following public opinion by criminal policymakers does not help implementation of justice. In this situation, instead of following public opinion, criminal brokers must have patience and tact and make policies based on scientific and rational principles. Moreover, technical characteristics of modern criminal law prevent the connection of criminal law to the public demands and opinion.





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**Violating the Defensive Rights of the Accused**

Defensive right of an accused means the accused's use of some privileges, protections and legal guarantees in judicial proceedings. In the philosophy of law and criminal rights, when one speaks of defensive rights of the accused, it refers to the accused's use of rights and guarantees stipulated in the process of preliminary investigations and proceedings. As a human being, everybody has some rights; these rights protect him against state and other individuals, he is free to implement them. In fact, defensive rights of the accused are the concessions given to him to answer his claims. While the state is obliged to prepare a field for his use of concessions and cannot limit them. An offender has these inevitable rights and state should accept them. Defensive rights of the accused are:

**Preventing the presence of people and the media in hearings**

The main purpose of public hearing is the presence of people to public scrutiny the courts. The presence of parties and even witnesses do not make a hearing public; but the doors of court should be open to all people without any discrimination. When there is no ban for the presence of people in court but some particular persons are not allowed to attend the hearing, investigation is still public. For example, children are not allowed to attend hearings due to possible psychological damages.

Hence, Iranian legislator predicted this issue in Article 189 of Criminal Code of Procedure for Public and Revolutionary Courts. In some cases, magistrate can prevent the presence of some witnesses to hear the words of another witness; this does not damage the public status of the court. (Article 196 of Criminal Code of Procedure for Public and Revolutionary Courts).

In order to prepare court for attendance of common people in the hearing of an especial case, they should be informed of the time and place of the trial previously; but Iranian courts are not obliged to announce the time and place of the hearings. It is worth that Iranian judiciary facilitate the presence of people by announcing its time and place in advance.

Although the openness of criminal procedure is a right of individual members of society, this right may be limited due to the material resources of trial place. Magistrate can only allow people, except parties and the lawyers, to attend the hearing as much as the space allows him or there are empty chairs for people. In some cases, when they are interested by public opinion, magistrate can order to hold the hearing in a bigger place to allow people to attend the hearing.

In addition to common people, media representatives can also attend the open hearings. They have a duty to report the hearing to the people who have not attended the court.

The audiences have no right to say their ideas and they should be silent during the entire period of investigation. They should avoid advocating in favor of each of the parties and disrupting the session. However, disruption or disorder by the audiences is not a reason for preventing public holding of the session; but the judge can arrest or fire the agitators of the court order (Note 2 of Article 188 of Criminal Code of Procedure for Public and Revolutionary Courts).

In the case of Old Henya, the judge did not allow other people, even victims, to attend the hearing by claiming that he needs space to talk frankly to the guilty man and be aware of all dimensions of the events. The judge may want not to be influenced by the presence of people beyond the parties of the case. Despite media representation of the crime, according to Article 188 of Criminal Code of Procedure for Public and Revolutionary Courts, "According to the court, the proceedings are open except in the following situations: 1- Unchaste acts and crimes against good morals," the



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judge announced that the session would be behind closed doors to prevent the presence of researchers and journalists. Not inviting victims to attend the session is a criticism against the conduct of the hearing. Although the judge declared the session closed, it seems that the victims and complainants had right to attend the session and defend their right. Nevertheless, the judge did not believe in presence of persons except guilty man, his lawyers, and Representative of the Prosecutor. He believed that the presence of child victims because of the possibility of trauma was not good and in the case of the presence of families, it is not possible to ask about the details of the events. Some may interpret not inviting families to the session, getting away from emotions, and not being influenced by the media in another ways. Maybe, media exaggeration is not important for the court and the crime of “war against God” is a general crime that should be investigated without the presence of victims.

**Emphasis on Oral Hearing**

Oral hearing has remained from the age of accusation hearing and it is still executed in many countries; for example, Article 193 of Iran’s Criminal Code of Procedure for Public and Revolutionary Courts, Article 212 of Iraqi Criminal Procedure Law, Article 302 of Criminal Procedure Law in Egypt, Article 176 of Syria Criminal Procedure Law, Article 212 of the Criminal Executive Code of Algeria, Article 151 of the Criminal Executive Code of Tunisia, Article 264 of the Criminal Executive Code of Yemen, and Article 148.H of Jordan’s Criminal Procedure Law.

It should be regarded as a means in open and close investigations. At the hearing, the complainant, the private plaintiff, defendant, witnesses, informed’s statements should be heard orally. Even if they have been stated in the case reports, magistrate cannot issue a sentence on their basis; but he should issue the sentence according to their oral declarations in the court. Perhaps, new evidence is proposed to help the discovery of reality. The accused should be interviewed about the ways he committed the crime. The accused’s defenses may present new evidence to the court. The statements of witnesses, and he referred persons should be heard and other party should be allowed to challenge the statements.

Therefore, holding session orally is a feature of open hearing because the public opinions control over the proceedings requires awareness of parties, witnesses, and proposed reasons. Thus, these items should be included in the proceedings to make people aware of justice administration. Justice that is fulfilled based on written reasons is not useful socially because people do not see its implementation.

In the case of Old Henya, the principle of holding hearing orally was observed because the judge did not satisfied by his written confessions (which are not written by his own hand), but invited him to the session to hear his statements directly and orally. By attending the court, the accused had the right to defend himself in front of the judge while this principle was not observed for the victims. It seems that the judges regarded the victims’ written statements at the stage of preliminary investigation enough and felt no need to invite them to hear their defenses directly.

**The Impact of Representation on the Judge's Impartiality**

Impartiality of the justice system is essential to establish a judicial system based on Islamic justice and remoteness of judicial system of any unhealthy relationship. Perhaps, fair trial is not violated when violation of impartiality is only in the “appearance and circumstances” of the proceedings (like judge’s rejection) or when it is manifested in “judicial conduct” so that it does not result in a sentence because pro appearance hearing damages to trust in healthy hearing and judgements. Although this issue should be considered, international instruments and regulations regard pro appearance of a hearing as violation of fair hearing.

In the case of Old Henya, observance of principle of impartiality in both process (courts and prosecutors) questionable. As mentioned, the need to maintain impartiality is not limited to the court and includes the





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investigation in court by prosecutor. Since the interrogator was in contact with newspaper reporters, especially Khorasan newspaper, and informed reporters of preliminary investigations and interrogation results and journalists demanded the most severe punishment as the result of their contact with public opinion, the interrogator had been under the influence of public opinion and he had imposed the most severe sensitivity and accuracy and rigor to collect proofs to issue a culpability verdict to satisfy the demand of people. The issuance of culpability verdict by him will be studied later.

This type of violation is seen in the court process in another way. Contrary to other represented cases on media, hearing had been mostly on the behalf of guilty man, not victims, because none of the victims or their families was not invited to attend the investigation session to defend themselves, which is an example of violating the plaintiff's rights. Due to having been unaware of the time and place of court, the complaints lost the opportunity to protest against the sentence; according to law, victim has the right to question the issued sentence by the court. This prudence has been included in the note to Article 232 of the Criminal Procedure Code Act 1378. Moreover, the judge issued sentenced him as innocence after the first investigation session; it seems that he had been so hasty to deal with such an important case. Although this may be the result of the fast representation of case news among common people and their expectation to deal with the case because judge's inquiry of legal office of the judiciary is a proof for his sentence. Finally, inquiry emphasized on the urgency of the issue and rush to reply.

Some legal systems try to motivate society against judges who choose tolerance policy for punishments; in this manner, they can pressure on them to change their trends and be consistent with them. For example, World's News newspaper in England in 2006 began the campaign of "say his name, fall his fame". The campaign decided to identify judges who issued mild penalties and introduce them to people. Therefore, they printed the name and picture of judges who had leniency towards the accuseds. The target of the campaign was the sentences for sexual offenders. This approach inspires that the judges who issue mild sentences are defenders of the criminals.

**Citing Invalid Legal Proofs**

In criminal matters, proof is everything that results in the discovery of the truth; thus, criminal field relates to a set of evidence and the circumstances. Katouzian believe that the existence of a right is not enough to use it; if right is not accompanied to proof, its implementation by state is not possible. Proof is a means to execute rights. Since the goal of punishing crimes is maintenance of social security and preventing perpetrators's dare, the sublime goal of penalty is revealed when the crime is proved. Proving a crime is carried out by proofs.

Although proof is not the goal of proceeding, it is the most important element in fulfillment of a right. Thus, the performance of criminal justice executors is conducted after discovery of the crime or the awareness of its occurrence based on collecting evidence in favor of or against the accused in all legal systems.

In the case of Old Henya, legal elements documented in culpability verdict are (1) Article 621 of Islamic Penal Code: "Anyone who, whether personally or through someone else, forcefully or by resorting to threat or deception or any other means, or conceals someone in order to blackmail or take revenge or for any reason, shall be sentenced to five to fifteen years' imprisonment. If the victim is less than fifteen years abducts old or if the abduction is carried out with a vehicle or if the victim is physically or sexually abused, the offender shall be sentenced to the maximum punishment provided; and if he has committed any other crimes he shall be sentenced to the relevant punishments as well." (2) the provisions of Article 637: "When a man and a woman who are not married to each other, commit indecent acts other than zina, such as kissing or sleeping next to one another, they shall be sentenced to up to ninety-nine lashes; and if the act is committed by force only the one who has used force shall be punished as ta'zir." (3) Article 619: "Anyone who assaults or disturbs children or women in public places or roads, or insults them with outrageous language and behaviors, shall be sentenced to two to six months' imprisonment and up to 74 lashes." (4)



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Article 441: "Defloration of a virgin by insertion of a finger that results in incontinence shall entitle the victim to her full blood money plus a sum equal to her potential dowry." (5) Article 183: "Any person who resorts to weapons to cause terror and fear or to breach public security and freedom shall be considered as a mohareb and corrupt on earth [mofsed fel-arz]."

There is no objection to the first to fourth provisions with respect to elements of crimes and offenses committed by the accused and ta'ziri crimes are correspond to the provisions; but for Article 183 of Islamic Penal Code, a mohareb and corrupt on earth is doubtful because contrary to the prosecutor's argument in culpability verdict that says "... in this article, corrupt is regarded as a separate crime of moharebeh; therefore, to meet the conditions of this crime (corruption on earth), using weapons is not necessary. There are many examples proving this claim in law and fiqh references. For instance, in punishing disruptors of economic system and killing a guilty man in execution of hadd on drinking wine for the third time as well as other hudud for the fourth time, although the accused has not used a weapon, but the punishment is categorized under the title of corruption on earth. In the case of Old Henya, as the accused has disrupted social order and created sense of insecurity among citizens as well as considering the size and distribution of crime, the idea of official expert in the field of public safety have been attached to the case for further proofs. Therefore, the action of the accused is discerned as corrupt on earth and his sentence is issued." This despite the fact that according to Article 183 of Islamic Penal Code, "Any person who resorts to weapons shall be considered as a mohareb and corrupt on earth [mofsed fel-arz]." It is not clear that how the judge has concluded that mohareb and corruption on earth are two separate criminal titles and resorting to weapons is not a condition for calling the case corruption on earth. The context indicates that these two criminal titles are not separate and resorting to weapons is a condition for calling the case corruption on earth. Thus, referring to Article 183 has not enough evidence and the law for disruptors of economic system calls one corrupt due to the existence of a special text that shall not be generated to other cases. It seems this argument is contrary to the principle of crime and punishment legality.

In addition to proofs for existence of legal element, prosecution official should prove the presence of material element of the crime or the accused's behavior including action, omission and assignment of criminal behaviors. Resorting to proofs in this stage is highlighted due to dealing with the principle of innocence or guilty man. The prosecution authority should prove that action or omission is attributed to what person and according to what criminal description. Of course, proving the conditions is a part of material aspect of the crime, not its adaptation with the law. In other words, the role of proof is to attribute a specific action to a person.

In the case of Old Henya, crime of corruption on earth as one of the hudud as well as some other ta'ziri crimes including kidnapping, rape and illicit affairs reluctantly and harassment of children have been charged on the guilty man.

Had punishments follow the patterns in the system of legal evidence because the proofs have been predicted by legislator. In this case, the crime of corruption on earth proposed by judges as a had punishment with reference only to Article 185 of Islamic Penal code. Since there is no witness in this case, the confession of the accused is the only reason to prove the crime. Then, the prosecutor and the judge cannot refer to another proof because it is had unless they refer to ta'ziri crimes attributed to the accused. Thus, one cannot claim the disrupt of public order in the country due to SMSs sent to Khorasan Newspaper asserting that people fear of disrupting social order; this is not useful for issuing a culpability verdict. The concerns had been emerged because of media representation of crime not because of crime occurrence. Nevertheless, only a handful of people who knew victims may be aware of the event, not all people (this possibility is weak because of honor and dignity of victims and their families). In the case of non-representation on media, no worrying condition would be emerged and the action would not be titled as disrupting social order of the country. If all cases of rape that are proposed daily in court of justice have been represented on media in this way, a chaos, protest and public worry may be revealed. Therefore, disrupting social order is true about crimes that have inherently this characteristic such as armed robberies of banks and gold shops that are accompanied with fear, panic and disruption in public order, not representation on media makes it severe disruption in public order. If one assert



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that the essence of criminal action is disruption in public order, it will be true about all crimes, not specific criminal actions. In this manner, it could be said that all crimes are corruption on earth. However, the question that whether there is a boundary for corruption on earth in law or not; or, whether filing such a charge to the accused is true or not will be explained later.

Another questionable point in the culpability verdict and indictment issuance of this case is reference to idea of official expert in the field of public safety about disrupting public order of the country and committing corruption on earth by the accused. Rather than doubting whether such a case should be referred to the expert or not, it is questioned that why the mentioned idea is based on possibilities and feelings? In an interview with the expert, his reasons for proving corruption and disruption are: (1) the victim may suffer from sense of revenge towards the opposite sex and commit such crimes in future. (2) The victim may suffer from depression and commit suicide in future. (3) The victim may have felt sexual joy and have sexual perversion and sex with others in future....

Therefore, deterrent actions should be so as not to have economic and emotional advantage to the guilty man. If the accused of Old Henya case is executed by death, the potential offenders think that whether the offense worth it or not. Now, if the system executes such offender, the potential offenders think that the offense risk their lives; thus it has deterrent aspect. Nevertheless, if he is punished by a sentence except death, committing this offense may worth for some criminals and the crime will be repeated in the society. Therefore, he believes that it is corruption on earth due to the following reasons:

1. Mental disorders and negative emotional impacts on victims as future mothers.
2. The victims' sense of disgust and hatred towards the opposite sex that will continue until the end of life.
3. Terror and fear among children under fifteen years and the lack of progress in the field of academics.
4. Disruption of public order, creating a sense of insecurity and undermining public confidence in the people that causes people's pessimism.
5. The future tendency of victims to commit different crimes such as corruption, prostitution and inciting revenge of the opposite sex because of their mental pains.
6. Ostracism of victims by relatives and close friends that results in spread of corruption and crime.
7. Relocation of people affected by crime in cities and other locations, which can have negative consequences.

It is concluded that crimes had been occurred in a relatively long time and it is an instance of 'corruption on earth' due to violation of the commandments of God, violation of the rights of others, violations of the laws and regulations.

He admitted in an interview that he concluded that the crime is corruption on earth after talking to the victims and their families and viewing the print of SMSs sent to to the Office of Khorasan newspaper.

Is it true to judge on a case without an acceptable reason and logic under the influence of emotions and possibilities? It seems that these reasons are raised due to legal gaps in the criminalization and punishment in accordance with the action of Old Henya.

Beyond, it is referred to culpability verdict and indictment refer to Islamic Penal Code on the basis that it divides Moharebeh and corruption on earth; it seems that the reference has not legal documentation and just shows that the judge was seeking to put the crime under the title of corruption on earth to convict him.

For realization of the mental element, it should be noted that Old Henya committed intentional crimes like child abuse and kidnapping; his bad intention should be proved using proofs. In Ta'ziri offenses, his general and specific bad intention was proved according to the confessions of the accused. Nevertheless, the questionable point relates to the had of 'corruption on earth' because the spiritual element of the crime includes general ill intention of action



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(using arms) and specific ill intention of trying to to achieve results (intention to create fear, panic and endangering public safety). There is no proof in this regard to prove the spiritual element. Since the accused had not intended to intimidate the public and had not used arms, one cannot claim that he had intended so.

**Retributive Judicial Interpretations**

A glance at the Iranian penal laws and regulations, especially Act on Intensifying the Punishment of Bribery, Embezzlement and Fraud (1988) and Counter Narcotics Act (1997), indicates that the legislator has adopted such rules with respect to social advantages of punishment (it public and private prevention) and he has disregarded the importance of crime and the extent of the damage and losses caused by it. In other words, he used the offender as a means to achieve a goal. However, using the offender as a means to achieve a goal (regardless of its legitimacy or illegitimacy) is contrary to the principle of the human beings' inherent dignity. In addition, History of the development of criminal law and field and experimental studies in criminology and penology show that crime prevention policies through toughen sanctions sanctions, especially physical punishment and depriving freedom (imprisonment) have been doomed to failure.

Therefore, criminal law should be removed from the area of justice and merit and fitness so that if it fails, the failure will not require injustice. Even it is proved scientifically that using such severe and harsh punishments are effective in the prevention of crime, criminal law will not be allowed to use such punishments because the goal does not justify the means.

It seems crimes with more probability to be represented on media such as sexual offenses, will be influenced more by retributive punishments. Increasing trend of sexual offenses representation in Iranian mass media and journalistic processing of news regardless of attention to the underlying factors of their occurrence has increased fear and insecurity in terms of this type of crimes; therefore, criminal justice authorities have turned to unscientific methods based on retributive punishments to absorb public opinion satisfaction. For example, rapid investigation and determination of severe punishments in the case of group rape in Khomeini Shahr of Isfahan and Kashmar accident have been implemented to satisfy public opinion.

Consequently, in the case of Old Henya, the investigation process had not been excluded from this rule because retributive judicial interpretations are seen in this regard and results had been severe.

The judges of the case in Public and Revolutionary Court in Mashhad city have accused the guilty man of the crimes with respect to (1) complaints by Parents and guardians of child victims, (2) reports of law enforcement authorities, (3) the way of identifying and arresting the guilty man, (4) encounter proceedings of the victims and the accused person and identifying him by victims according to his specific characteristic (amputation of first of the knuckle of his second and third fingers in the right hand), (5) explicit, frequent and proved the accused's statements and confessions, (6) Certificates issued by forensic on the amount of damages to female victims, as well as the idea of authority about mental health of guilty man, (7) idea of official expert in the field of public safety, (8) common investigations and other evidence and documents in the case.

Relying on the verse 33 of Surat Al-Mā'idah, (meaning Indeed, the penalty for those who wage war against Allah and His Messenger and strive upon earth [to cause] corruption is none but that they be killed or crucified or that their hands and feet be cut off from opposite sides or that they be exiled from the land.). It is obvious that corruption one earth and moharebeh are two distinct foundations, corruption one earth contains all sins with public corruption including spread of corruption and vice, adultery, forgery, transportation, storage, and distribution of narcotics, etc. they are instances of corruption one earth, not moharebeh because causing terror among people have not been carried out by arms in past; therefore, a distinction of public and private will rise in this regard. It means mohareb is





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certainly corrupt on earth, but not every corrupt is a mohareb. Considering the size and distribution of crime, the idea of official expert in the field of public safety the action of the accused is discerned as corruption on earth. With regard to the age of the victims that were mostly defenseless female children and not able to defend themselves, the action of guilty man that has irreparable negative impact on the fate and the future life, the age of the accused who has over 60 years old have families and children, holy lawyer and legislator have intensified the punishment for indecent actions. Article 86 of Islamic Penal Code stipulates, "Adultery by a man or a woman when each has a permanent spouse but has no access to the spouse due to travel or imprisonment or similar reasonable excuses, shall not constitute stoning." Therefore, according to Articles 46, 47, 183, 441, 619, 621, and 637 of Islamic Penal Code, Articles 4 and 5 of aw for the Protection of Children and Adolescents (2002), observance of Articles 55 and 183 of Law on Criminal Procedure (1999), and Vote of Unified Approach (N. 709, 2008), maximum penalty was requested for the guilty man.

As noted, legal interpretation of mohareb and corruption on earth is broad and the title of corruption on earth is not true for the offenders's crime because:

1. Corruption on earth is not independent and separate from the moharebeh. Regardless of the accuracy of the accused's defenses in hearing about the number of kidnapped people, it should be acknowledged that first, the great difference between crimes deserved had and other crimes is that determination of type and quantity of penalties is duty of God and Islamic ruler has no authority in this issue, contrary to ta'ziri crimes and punishments that Islamic ruler should determine them. Second, although the Iranian legislator introduces corruption on earth with an "and" along with moharebeh in the seventh chapter of Book II of Islamic Penal Code, there is no doubt that the legislator did not decided to introduce a new type of crime independent of moharebeh. It is proved y a look at Article 183 and 196 that are going to explain the nature of moharebeh, its conditions, its proofs and its penalties, especially Article 183 that is documented to the indictment of the prosecutors. As two elements of moharebeh are using arms to fear people and, the elements are not elements of corruption on earth; therefore, it is not reasonable to conclude that legislator had intended to found a crime called 'corruption on earth.' If the legislator decided to found title of corruption on earth as a crime deserving had independent of moharebeh, he should determine a specific had for it like other cases; then, he could explain its nature, conditions, proofs and penalties. However, Iranian legislators mentioned corruption on earth in some other cases such as "A bill amending the law on how to punish those who are illegally in audiovisual activities" and "Bill to prevent crime", etc. Due to ambiguity and synopsis of the matter, lack of explaining boundaries and nature of the corruption and lack of determining penalty for corruption on earth, one cannot use these instances to prove it.

2. Fiqh texts have not introduced corruption on earth as one of the instances of hudud. Although some jurists have mentioned corruption on earth in determination of some penalties (such as cutting off the fingers of thief in when there is some degree of theft), they have nt mentioned this title independent of another instances of had. According to verse 33 of Surat Al-Mā'idah that is the main document for moharebeh, it says: along with (meaning "strive upon earth [to cause] corruption" and "the penalty for those who wage war against Allah"). In this regard, jurists argue that it describes only moharebeh and they propose the subject of 'using arms to fear people. Hence, there idea is some sort of analysis to prove that title of 'corruption on earth' is enough. It means they define such punishment for moharebeh because it is a kind of 'corruption on earth'. Of course, one cannot assert that the analytical status of is enough to prove title of 'corruption on earth' because the verse signifies that moharebeh has such penalty because it is 'corruption on earth', not the punishment for every moharebeh is like 'corruption on earth.'

In the event of deviation from the previous entry and accepting that 'corruption on earth' is an instance of Hudud, it is not true about our case because first, 'corruption on earth' is a general title with multiple instances of different ranks. In the absolute status of crime, a kind of corruption is laid on earth. Yet, how much should be the corruption on earth to deserve had punishment? No explicit entry has been stated by the legislator in this regard. Therefore, there is an ambiguity on the concept and the accused will not be punished according to this condition. In this



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manner, even the paragraphs A and B of “A bill amending the law on how to punish those who are illegally in audiovisual activities” and Article 4 of “The intensification of the fight against violent crime” cannot run and this provision cannot be used to punish an offender. Second, in the case of deviation from last entry and necessity of acquiring a part of truth, the title of corruption is met when the offense is inherently a kind of disruption of social order and creates social and public chaos. In fact, although our subject has been very Very obscene, it cannot disrupt social order. The amount of fear and terror in society has been normal because he has committed his crime for a long time due to failure to identify the accused. The fear of number of crimes is not enough to meet the conditions of corruption. If a person committed numerous ta'ziri crimes for a long time due to failure to identify him, the regulation of crime multiplicity will be run and he is not called corrupt on earth. For example, although the case of killing prostitutes (the case of Saeed Hanaei) were more severe than the case of Old Henya and the terror and fear were much more than Old Henya, the accused did not convicted as corrupt. Third, in the case of deviation from previous words and accepting the title of corruption on earth for the action, what is his punishment? The predicted penalty in the seventh chapter of Book II is merely for moharebeh and the punishment for corrupt has not been determined. In addition, it is a controversial issue in Islamic fiqh. Thus, what articles should be used to punish this guilty man with these lines, the accused's crime is not corruption on earth, but the judges had issued indictment and culpability verdict in the investigation stage with emphasis on his corruption; then, they sent the case to Mashhad Revolutionary court; of course, the accused was acquitted in terms of corruption on earth.

Populist criminal programs try to divide society in two groups of “self” and “the others.” In this division, the members of “self” group are civilized, law-abiding and moral majority while the others' group is a dangerous group that should be identified, controlled, and quarantined. In this perspective, the policies are divided on the grounds of winner-loser culture, self-other, insider-outsider, domestic and stranger. In this discourse, a discriminatory and violent approach is developed against the members of the other group. This perspective is contrary to the idea that regards crime as a natural phenomenon happening surely, but it should be controlled. In this view, offenders are normal people, reasonable customers and of our nature. According to David Garland, the first perspective is proposed in “The other criminology” and the latter idea is proposed in “Self- criminology.”

This discourse has been developed as “Citizens' criminal law” and “enemies' criminal law” in the ideas of Gunter Jacob, criminal law professor at the University of Bonn. For him, taking the advantages of ‘enemies' criminal law’ is legal and allowed in special cases. He argues that the opponents of legal order have lost their citizenship rights and the state can fight them using every tool. It should be noted that he does not mean the existence of two different criminal laws in a country, but he believes that only one criminal law is run in a country. This criminal law is a combination of aspect that focuses more on citizens and aspect that addresses mostly the enemies.

Criminal populism agrees that unsuccessful experience of correction and care policies in the past decades have shown that this dangerous group is not reform able and their presence in society endangers the security of vast majority of law-abiding citizens. Thus, their danger should be eliminated through different methods. Using strategies that eliminate individuals permanently or temporarily such as death penalty and long prison terms are their common suggestions for remove the risk of offenders. The governance of the other-based ideas on criminal policymaking have lead them to use terms like war to stimulate people to fight against crimes. Using terms like “war against crime,” “war against drug” and war against terrorism” have been proposed in this regard. Consequently, in the process of criminal prosecution, judicial interpretations of the crimes and criminal law have been done in such a way that the accused will surely be convicted to corruption on earth and the maximum penalty will executed to sho a reaction for people who follow news on the case of Old Henya.





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## CONCLUSION

This article tries to investigate deeply the criminal case of Old Henya represented on media about child abuse, kidnapping, deliberate physical injury, and forcible indecent behavior; it studies the effect of its media representation on the process of criminal prosecution. In other words, it seeks to find the violations of rights occurred in this regard. The effects of its media representation on the violation of the defensive rights of the accused are impartiality of the judge, comments with bias, and lack of observing process of interrogation. Moreover, emotional discourse, retributive judicial interpretations, and citing invalid legal arguments are the results of this event. Studies have shown that the representation of case on media influenced on the work process of the judiciary authorities and using retributive approaches as well as try not to hold public hearings.

### It is suggested

1. With the advent of yellow press that centers upon emotional discourse and print of unscientific and tragic news, chance of reading scientific and informative analysis for the audience has been faded. In addition to the training of various social groups to reduce further victimization, using rich media and theories of criminologists and sociologists for scientific analysis of printed crime reports pave the way for correct approach to the news and prevention of creating an emotional space.
2. Judges and authorities in the media represented cases are at the risk of being under the influence of populism and media reports. As the authorities of this case had compared the female victims to their own daughters, they made emotional and retributive decisions. In this regard, training for judges and criminal justice authorities to reduce the effects of populism can be beneficial.
3. Interviews performed on the offender have determined that he was abused in childhood by two workers and his parents were oblivious to this thread. Although some argue that bad conditions of past life is not a justification for committing crimes in the future, filing personality and attention to a person's life and childhood in fair and informed decisions by a judge will be useful. In addition, reflection of offenders' problems in childhood and adolescence can cause reduction of emotional space with an emphasis on retribution as well as awareness of parents.

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## Ranking Cities of Lorestan based on their Capability for Development of Processing Industry and Downstream Industry

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Received: 27 Mar 2015

Revised: 25 Apr 2015

Accepted: 29 May 2015

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### ABSTRACT

In order to achieve economic, social and national security, the importance of achieving self-sufficiency in the production of strategic agricultural products in each country has been highlighted. In this situation, the emergence of new opportunities for local and regional development and making proper decisions about prediction of proper location for establishment of an industry are very important. With abundant water resources, fertile land and suitable climate, Lorestan province is an agricultural hub; meantime, some of these products are used for direct consumption in the existing industries. In general, the capacities and talents of agricultural land and orchards of every region are different from other areas; therefore, every region requires specific processing and downstream industries. Therefore, it is necessary to identify the processing and downstream industries in accordance with the agricultural and horticultural capacities and talents of the province. Then, they should be prioritized by experts and specialists to assist officials to make proper decisions. In this regard, this research ties to prioritize the cities of Lorestan province based on their horticultural capabilities using taxonomy method. The findings of this study can be used in making decisions about different ways of allocating land to garden products so that it employs the maximum potential of the cities and improves horticultural products of Lorestan province, and horticultural products in Iran.

**Key words:** processing and downstream industries, the capabilities of horticultural production, taxonomy, Lorestan.







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## INTRODUCTION

Self-sufficiency in the production of strategic agricultural products and food security are important for every country to achieve economic, social and national security. Self-sufficiency in agriculture is the basis for independence and self-sufficiency in other areas because food and food security are important not only economically and socially but also as a political tool used by industrialized countries. Hegemonic countries have always used the food requirements and lack of independence of target countries as an efficient and effective pressure to achieve their objectives. After World War II, farmers' ongoing poverty, waste of natural resources and environmental rots cause resourceful solutions. Humankind learned to move parallel to nature and exploit land based on their capabilities to prevent poverty and waste of lands. In addition, it based the use of lands according to its practical capability; he should estimate human economic and social needs based on the land.

Since the location of an industrial unit has a major impact on product prices, social, cultural and environmental issues, the degree of market penetration etc and while changing the location of a production unit is not possible after its establishment in a particular place, it is necessary in industry positioning and location to consider all factors and critical parameters involved in the planning in order to select the most optimal sites and locations. Lorestan is one of the most fertile provinces in Iran and it can be the producer of various products in the agricultural sector due to the special geographical position. Hence, it can present new products by establishing processing and downstream industries. Each part of the province has different advantages for the establishment of industries. This article seeks to find "what cities have the capability to establish what processing and downstream industries in agricultural sector?"

In general, agricultural and horticultural capacity and capabilities of every region is different from other areas; therefore, the establishment of processing and downstream industries will be different in different areas. Thus, it is necessary to identify the processing and downstream industries in accordance with the agricultural and horticultural capacities and talents of the province. Then, they should be prioritized by experts and specialists to assist officials to make proper decisions. Lorestan has a very high potential to attract and build processing and downstream industries because of its good context of soil and water for the greenhouse crops and fruit gardens, fertile lands, regional diversity, diversity of vegetation, rich source of surface water and underground water resources etc. Nevertheless, processing and downstream industries of agricultural sector have not been prospered and little attention has been paid to this section. To allocate different parts of Lorestan for different agricultural products, little attention has been paid to these sectors. This research tries to reach a comprehensive understanding of the agricultural potentials of Lorestan and determine the capabilities of this province in the establishment of agricultural processing industry in each city. Accordingly, the main purpose of this study is to identify the capabilities of agricultural sector in Lorestan and ranking them in terms of the potential for any products, the study specifically focused on the types of fruits. This study assumes that the potential of different cities of Lorestan is not the same in attracting different types of processing and downstream industries in agricultural sector.

### Theoretical Foundations

**Processing and downstream industries** According to the latest definition adopted by the State Economic Commission, processing and downstream industries are the industries in which vegetable and animal products (agriculture, horticulture, fisheries, livestock, forestry and pasture) are processed and produced. Processing includes physical and chemical changes, storage, packaging and distribution (Ministry of Agriculture, 2005). In fact, agricultural processing and downstream industries have both direct and indirect linkages with the agricultural sector. In other words, downstream industry is a set of industries taking action to produce, grade, and pack, maintain, market, and distribute products by performing physical and chemical changes on the raw materials with vegetable and animal origin. Processing industry are the industries in which an agricultural product is transformed for better use, supply, and economic gain so that the nature of new product is identical to the nature of raw material,



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but the final product is a new material compared to the the raw material (Deputy of Rural Industry and Development, 2004).

**Multiple-criteria decision-making** Decision-making may be multiple-criteria or single-criteria. The criteria can be quantitative, qualitative or a combination of both (in the case of multiple-criteria); decision-making approach is different in each of these cases. Decision-making is convenient in the discrete and single-mode criteria. Suppose one decides to choose a shorter path from two paths (quantitative scale), it is enough to define a unit of length and measure the path on which basis. When the criterion is qualitative, decision-making is difficult to some extent and it is necessary to first define the standard (Ghodsi Poor, 2006). If multiple-criteria (both quantitative and qualitative) are proposed, conversion of criteria to each other rises as a further difficulty. Therefore, multiple-criteria decision-making process is faced with two main problems: (1) lack of standard for measuring qualitative criteria and (2) lack of unit to convert criteria (both quantitative and qualitative) to each other.

Given the problems related to the decision-making process with multiple criteria, it can be said that decision-making is not easy in this regard and the speed and accuracy of decisions will be reduced due to the absence of a standard. This leads to personal decisions. To fix this problem or to minimize its side effects, multiple-criteria decision-making methods have been proposed; each method follows certain rules and principles and has certain advantages and disadvantages (Ghodsi Poor, 2006).

Numerical taxonomy method: A classification system that deals with the grouping by set of indicators.

**LITERATURE REVIEW**

In addition to expressing natural, economic and social characteristics of Kohgiluyeh Boyer Ahmad to establish processing industry, Hamid Dehbashi (1996) identified the capabilities of this region in his M.A. thesis titled "The feasibility of establishing processing industry in Kohgiluyeh Boyer Ahmad." He studied factors such as raising the level of participation of the people, strengthening infrastructure and attracting investments and argued that processing industry reduces unemployment, reduces migration and leads to dynamic economy in the province. In "Application of TOPSIS techniques in place prioritizing for the establishment of agricultural processing industry in rural areas," Mehdi Taherkhani (2007) investigated international experiences in this field and showed that agricultural processing industry in rural areas can increase rural products, productivity, employment, and inter-sections relations and it reduces regional imbalances. However, the success of processing industry in rural areas depends on choosing the best location for the establishment of industrial activities.

In his M.A. thesis "The feasibility of establishing industries in Bijar," Alireza Zandian (1999) explained the potentials of agriculture and industry and presents statistics about the capabilities of these industries using questionnaire. He investigated the effects of establishing agricultural production and livestock industry and argued that processing industries have a major role in reducing migration, increasing employment and income, economic output and the mode of production. In "The prioritization of developing agricultural processing and downstream industries using Delphi method in Falavarjan," Noori and Nili Poor (2007) studied processing and downstream industries fit to the conditions of each city. Engineering Institute of the Ministry of Agriculture (2006) conducted a research titled "Understanding the relative advantages and capabilities of establishing agricultural processing and downstream industry in Chahar Mahal and Bakhtiari." In addition to studying the theoretical foundations of regional planning, it took successive steps for the feasibility of the industries. In this program, the province was divided into different regions at first; considering two groups of agricultural and non- agricultural factors using matrix of regional features and industrial needs, the capabilities of each region for establishing different agricultural processing and downstream industries were identified based on 4-digit ISIC codes.





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## METHODOLOGY

The study is implemented in some stages as the following:

**First stage** Browsing useful information sources and experience in national and international level on processing and downstream industries.

**Second stage** Studying natural and human features of Lorestan.

**Third stage** Studying agriculture-related sectors.

**Fourth stage** Classifying cities of the province by Taxonomy.

### Data Collecting Method

Using library-based methods, the required data have been extracted from national and international sources, academic institutions, government agencies, State Environmental Protection Administration, the provincial Department of Natural Resources, The Ministry of Jihad-e-Agriculture, Lorestan Governor and other agencies. In addition, the researcher has gathered data through questionnaires and interviews with officials and experts from the relevant departments. Data used in the study include:

Basic information about the province's natural environment (climate, location, etc.).

Information about the socio-economic situation of the cities of Lorestan.

Status of horticultural production in gardens.

## FINDINGS

### General Information about Lorestan Province

Covering an area of 28,559 km<sup>2</sup> in the West of Iran, Lorestan Province is located between 46°, 51' to 50°, 3' eastern longitude of the Greenwich meridian and 32°, 37' to 34°, 22' north latitude from the equator. Lorestan province consists of 9 cities including Aligodarz, Borujerd, Khoram Abad, Dorood, Koozdasht, Azna, Pole Dokhtar, Selseleh and Delphan. Khoram Abad is political and administrative center of the province; the province has 22 towns, 25 districts, 81 villages and 2842 residential areas. In terms of climate and weather, it has four seasons and variety of climates. With 550 Millimeters average annual precipitation, Lorestan is the third Iranian province after Gilan and Mazandaran. The maximum-recorded temperature is 47.4 and the minimum absolute temperature recorded is 36. There are 35 mountains with an altitude of over 3000 meters in the Province. Lorestan Mountains are located regularly from northwest to south in the main Zagros heights; they have deep, aggregate, long and uneven valleys. According to 13-years data of Meteorological Organization (2003-2006), Lorestan has average air temperature of 15.2 ° C, mean minimum temperature of 6.7, and mean maximum temperature of 22.8 ° C. According to reports, the average relative humidity in different months in 1998 in the province was 34.5% with a range from 11.4 percent in July and 60.2 percent in January. In general, Lorestan has four humid months, four semi-humid months, and four dry months. The annual precipitation is about 428 mm in the last 10 years, ie twice the average rainfall in the country. Despite the rainfall, the region is semi-arid; its distribution in different months and seasons is unbalanced and



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inappropriate. According to the data and the characteristics of the province, it can be said that there are seven months of frost in a year. There are three identified weathers in the province. First, mountainous cold with snowy and very cold winters and mild summers; this region is located in north, north-west and east of Lorestan. Second, central mild that is the intermediate of mountain region in north, northeast and the south. Third, Southern hot in the areas with the minimum height; due to the impact of Khozestan hot winds, low latitudes and high altitudes, this region has the maximum temperature in summers. In terms of water resources (surface and underground), Lorestan province has a good condition. There are 23 rivers in Lorestan; they are divided into three groups based on their basins. Rivers in Karkheh and Dez basins contain 96 percent of the all rivers, and Central basin includes a small area of the easternmost part of Lorestan province. Groundwater resources of the province is 15051 including wells, springs and Qanats that are distributed in 27 study area. Geologically, Lorestan is a mountainous terrain and there is no even land in the province except few alluvial valleys and limited plains. Young Zagros Main Fault, Reverse Fault of Zagros, Seismic Fault of Dorood, and Quaternary Faults of Nahavand are the main faults in the province. Based on the latest changes in the administrative divisions, Lorestan has 10 cities, 27 districts and 84 rural regions. Lorestan has 23 towns, and 3000 villages. The cities are Aligodarz, Borujerd, Khoram Abad, Dorood, Koohdasht, Azna, Pole Dokhtar, Selseleh and Delphan.

**The Potentials in the Garden****Pome Fruits**

The total annual production of pome fruits is 50250 tons. 57.54 percent is produced in Borujerd, 12.28 percent in Dorood, and 10.65 percent in Khoram Abad. Borujerd has the largest share (57.54%) and Pole Dokhtar has the lowest share (0.14%) in the production of pome fruits in Lorestan.

**Stone Fruits**

The total annual production of stone fruits is 67435 tons. 37.26 percent is produced in Borujerd, 23.67 percent in Dorood, and 23.56 percent in Khoram Abad. Borujerd has the largest share (37.26%) and Pole Dokhtar has the lowest share (0.23%) in the production of stone fruits in Lorestan.

**Berries**

The total annual production of berry-fruits is 42247 tons. 37.07 percent is produced in Khoram Abad, 34.79 percent in Borujerd, and 6.39 percent in Dorood. Khoram Abad has the largest share (37.07%) and Selseleh has the lowest share (0.97%) in the production of berry-fruits in Lorestan.

**Nuts**

The total annual production of nuts is 20630 tons. 21.97 percent is produced in Khoram Abad, 21.75 percent in Borujerd, and 17.04 percent in Delphan. Khoram Abad has the largest share (21.97%) and Koohdasht has the lowest share (0.88%) in the production of nuts in Lorestan.

**Other Cold-Climate Fruits**

The total annual production of in this regard is 38 tons. 25 tons belongs to jujube produced only in Aligodarz and 13 tons belong to hawthorn produced in Borujerd.





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#### Subtropical Fruits

The total annual production of subtropical fruits is 50580 tons. 51.48 percent is produced in Koohdasht, 36.82 percent in Pole Dokhtar, and 11.34 percent in Khoram Abad.

#### Ranking Based on the the Potential of Horticultural Products

##### First stage Formation of data matrix

Due to the large number of parameters in horticultural products, the place of rows and columns has been replaced to enable researchers to locate all cities and indexes in one table. Table 1 shows the percent of horticultural crops in Lorestan province segregated by city.

Since the indexes are stated as percentages, all indexes have the same mean and standard deviation. Table 2 shows the mean and standard deviation of indexes in horticultural productions and Table 3 represents standard matrix of horticultural productions.

##### Second stage Formation of standard matrix

##### Third stage Formation of distance matrix

##### Fourth stage Determining the shortest distance (dr) in each row of symmetric matrix

In this stage, the shortest distances are calculated based on distance matrix. For drawing the chart, the second shortest distance is calculated in addition to calculation of first shortest distance. Table 5 shows the two shortest distances in one row.

#### Charting

The following chart has been drawn based on the shortest distances. The shortest path between each two paths should be mentioned.

##### Fifth stage: Calculation of Upper limit (O+) and lower limit (O-) to explain the homogeneous places

Cities that are located between lower limit and upper limit are called homogeneous cities. When a city is scored above the upper limit, there is no similarity in terms of development between the city and other cities. All cities above and below the the desired range should be remove from considerations.

The range is obtained from the following formula:

$$Or = dr \pm 2 sd$$

The value of this range is:

$$-1.88 < Or < 7.60$$

Based on this range, all cities are homogeneous.

##### Sixth Stage Determination of the ideal amount (Doj) from standard matrix





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If all activities in the previous section do not place in a homogeneous. A data matrix for all homogeneous activities should be designed. Then, it should be standardized, the ideal amount should be found for each index and status of each activity should be evaluated for each activity. Choosing ideal amount depends on the type of index; if the selected index is positive (the index values are increasing), it is more capable. The biggest value is regarded as the ideal amount. If the index direction is negative, big number reflects lack of capability; therefore, the smallest value is considered as ideal amount.

Ideal amount that is the biggest number of each index is calculated using standard matrix. The values are provided in Table 6.

**Seventh stage** Calculation of development pattern (C<sub>io</sub>)

In order to calculate development pattern, standardized values for each of the indexes are subtracted from the ideal value; then it should be squared. Next, the sum of all values of each row is calculated and its square root is taken; the result is the numerical value of development pattern.

Small value of development pattern indicates more development of a city. It shows that the distance between this city and ideal city is fewer; hence, great amount of development pattern signifies lack of development. The values of development pattern for horticultural productions are mentioned in Table 7.

**Eighth stage** Calculating the degree of development in the locations

The following formula calculates the degree of development in the cities.

Degrees of development in the cities are equal to division of development pattern to upper limit of development pattern; upper limit of development pattern is the mean plus 2 of development pattern's standard deviation.

$$CO = C_{io} + 2 S_{io}$$

$$C_{io}$$

$$di = C_{io} + CO \quad \gg \quad Fi = \frac{C_{io}}{CO}$$

$$CO$$

Mean: 49.88

Standard deviation: 4.46

C<sub>o</sub>: 58.81

The degree of development is between zero and one. The closer to zero, the more developed is the city; the closer to one, the less developed is the city. The degree of development of the cities and the assigned rank to each city is shown in Table 8. As seen in the above table, Borujerd is the most developed city in Lorestan province in the terms of the gardens. Therefore, more attention should be paid to this city with respect to establishment of horticultural processing and downstream industries. After Borujerd, Khoram Abad, Aligodarz, Koohdasht, and Pole Dokhtar are placed in the next ranks, which are relatively close to each other and have no significant superiority to each other.

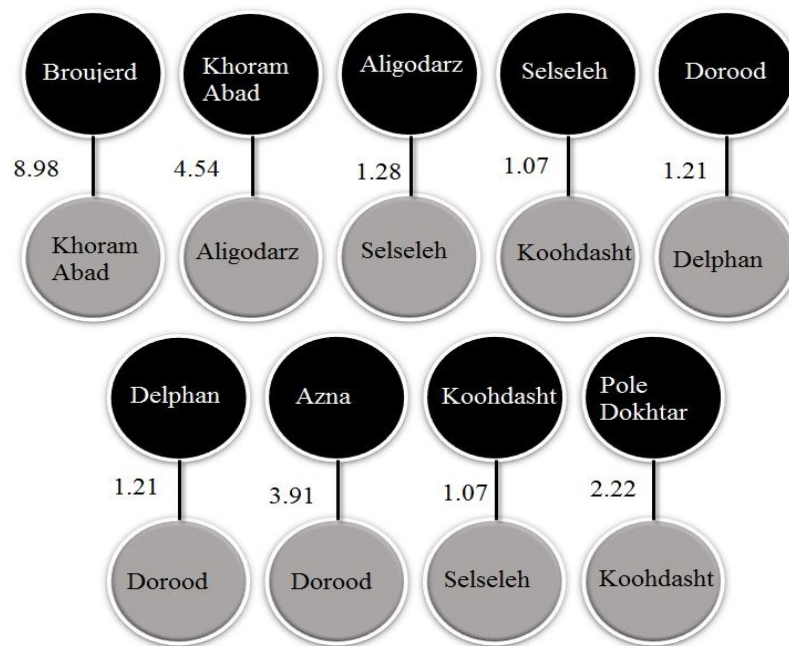




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**Figure 1: The shortest distances in horticultural productions (source: researcher)**

According to the relations, the following figure is the summarized version of above figure.





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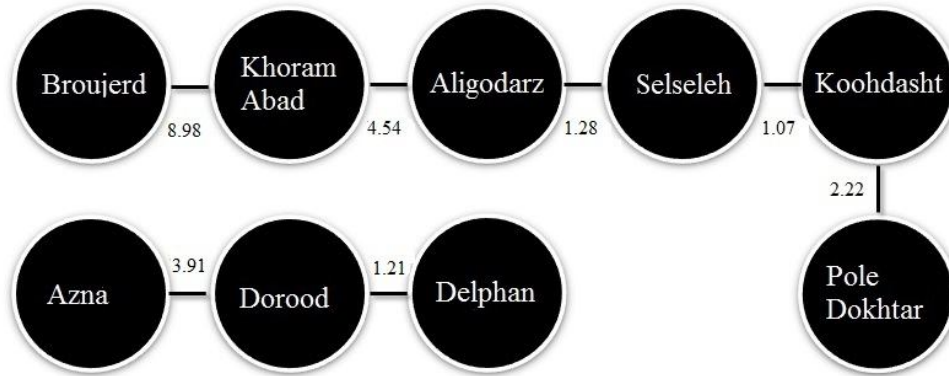


Figure 2: The shortest distances in horticultural productions (source: researcher)

This chart is still a separated body. Thus, the figures of the second shortest distance are used; the results are stated in Figure 3.

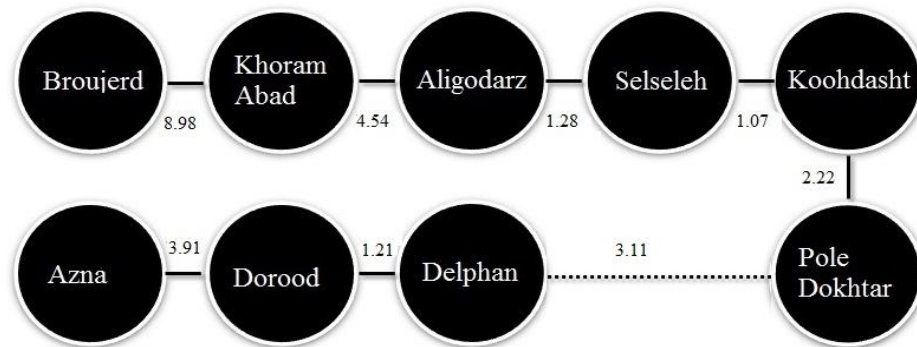


Figure 1: The shortest distances in horticultural productions (source: researcher)

Mean and standard deviation of the figures in above chart should be calculated. It should be noted that two-way relations have calculated twice.

Mean: 2.86

Standard deviation: 2.37







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**Table 1: The production percent of horticultural crops in Lorestan for each city (source: researcher)**

| Cities Fruits          | Brojuerd | Khora m Abad | Aligodar z | Selsele h | Doroo d | Delpha n | Azn a | Koohdas ht | Pole Dokhtar |
|------------------------|----------|--------------|------------|-----------|---------|----------|-------|------------|--------------|
| Apple                  | 58/58    | 10/63        | 0/21       | 14/79     | 12/71   | 1/46     | 1/35  | 0/15       | 0/13         |
| Pears                  | 20/47    | 14/18        | 0/00       | 45/76     | 1/47    | 9/00     | 1/18  | 7/94       | 0/00         |
| Quince                 | 81/82    | 2/73         | 0/00       | 0/18      | 8/73    | 0/91     | 1/82  | 1/82       | 2/00         |
| Sour cherry            | 54/17    | 2/25         | 0/00       | 37/50     | 1/50    | 1/50     | 0/83  | 2/00       | 0/25         |
| Cherry                 | 83/33    | 3/81         | 0/00       | 1/85      | 7/22    | 2/11     | 0/15  | 1/11       | 0/41         |
| Different plums        | 25/49    | 47/58        | 0/51       | 14/95     | 5/95    | 1/78     | 0/17  | 2/55       | 1/02         |
| Apricots               | 10/48    | 18/44        | 0/71       | 2/86      | 60/03   | 1/91     | 5/45  | 0/00       | 0/12         |
| Peaches                | 56/55    | 19/38        | 0/84       | 6/90      | 7/59    | 7/93     | 0/13  | 0/55       | 0/14         |
| Nectarine              | 29/13    | 43/94        | 0/86       | 7/57      | 8/57    | 8/57     | 0/00  | 1/14       | 0/21         |
| Peach                  | 13/38    | 59/08        | 0/00       | 6/46      | 0/00    | 21/08    | 0/00  | 0/00       | 0/00         |
| Water grapes           | 34/88    | 37/26        | 3/10       | 0/71      | 6/43    | 1/14     | 6/31  | 5/48       | 4/69         |
| Dry grapes             | 2/67     | 5/33         | 0/00       | 68/00     | 0/00    | 24/00    | 0/00  | 0/00       | 0/00         |
| Strawberries           | 12/77    | 0/00         | 0/00       | 17/02     | 0/00    | 31/91    | 0/00  | 38/30      | 0/00         |
| Mulberry               | 88/37    | 9/30         | 0/00       | 0/00      | 2/33    | 0/00     | 0/00  | 0/00       | 0/00         |
| Barberry               | 0/00     | 0/00         | 100/00     | 0/00      | 0/00    | 0/00     | 0/00  | 0/00       | 0/00         |
| Pistachios             | 0/00     | 10/53        | 0/00       | 0/00      | 0/00    | 0/00     | 0/00  | 89/47      | 0/00         |
| Water Almond           | 22/73    | 2/97         | 28/64      | 2/30      | 10/42   | 9/27     | 20/21 | 2/00       | 1/45         |
| Dry Almond             | 66/67    | 2/00         | 26/67      | 3/33      | 0/00    | 1/33     | 0/00  | 0/00       | 0/00         |
| Walnut                 | 20/59    | 26/06        | 3/53       | 19/41     | 9/24    | 18/82    | 0/65  | 0/59       | 1/12         |
| Hazelnut               | 94/55    | 0/00         | 1/82       | 0/00      | 0/00    | 3/64     | 0/00  | 0/00       | 0/00         |
| Elaeagnus Angustifolia | 82/08    | 0/00         | 2/83       | 9/43      | 0/00    | 5/66     | 0/00  | 0/00       | 0/00         |
| Hawthorn               | 100/00   | 0/00         | 0/00       | 0/00      | 0/00    | 0/00     | 0/00  | 0/00       | 0/00         |
| Jujube                 | 0/00     | 0/00         | 100/00     | 0/00      | 0/00    | 0/00     | 0/00  | 0/00       | 0/00         |
| Olive                  | 0/00     | 66/36        | 0/00       | 0/00      | 0/00    | 0/00     | 0/00  | 10/91      | 22/73        |
| Citrus                 | 0/00     | 10/26        | 0/00       | 0/00      | 0/00    | 0/00     | 0/00  | 0/00       | 89/74        |





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|                    |      |       |      |      |      |      |      |       |       |
|--------------------|------|-------|------|------|------|------|------|-------|-------|
| <b>Pomegranate</b> | 0/04 | 13/27 | 0/40 | 0/00 | 0/00 | 0/09 | 0/00 | 85/00 | 1/20  |
| <b>Fresh figs</b>  | 0/06 | 5/08  | 0/00 | 0/00 | 0/00 | 0/00 | 0/00 | 2/25  | 92/61 |

**Table 2: Mean and standard deviation of indexes in horticultural productions (source: researcher)**

|                    |       |
|--------------------|-------|
| Cities             | Index |
| Sum                | 100   |
| Mean               | 11/11 |
| Standard deviation | 6/80  |

**Table 3: Standard matrix of horticultural productions (source: researcher)**

| Cities Fruits          | Brojue rd | Khora m Abad | Aligo darz | Selseleh | Dorood | Delphan | Azna  | Koohdasht | Pole Dokhtar |
|------------------------|-----------|--------------|------------|----------|--------|---------|-------|-----------|--------------|
| <b>Apple</b>           | 6/98      | -0/07        | -1/60      | 0/54     | 0/23   | -1/42   | -1/44 | -1/61     | -1/62        |
| <b>Pears</b>           | 1/38      | 0/45         | -1/63      | 5/10     | -1/42  | -0/31   | -1/46 | -0/47     | -1/63        |
| <b>Quince</b>          | 10/40     | -1/23        | -1/63      | -1/61    | -0/35  | -1/50   | -1/37 | -1/37     | -1/34        |
| <b>Sour cherry</b>     | 6/33      | -1/30        | -1/63      | 3/88     | -1/41  | -1/41   | -1/51 | -1/34     | -1/60        |
| <b>Cherry</b>          | 10/62     | -1/07        | -1/63      | -1/36    | -0/57  | -1/32   | -1/61 | -1/47     | -1/57        |
| <b>Different plums</b> | 2/11      | 5/36         | -1/56      | 0/57     | -0/76  | -1/37   | -1/61 | -1/26     | -1/48        |
| <b>Apricots</b>        | -0/09     | 1/08         | -1/53      | -1/21    | 7/20   | -1/35   | -0/83 | -1/63     | -1/62        |
| <b>Peaches</b>         | 6/68      | 1/22         | -1/51      | -0/62    | -0/52  | -0/47   | -1/62 | -1/55     | -1/61        |
| <b>Nectarine</b>       | 2/65      | 4/83         | -1/51      | -0/52    | -0/37  | -0/37   | -1/63 | -1/47     | -1/60        |
| <b>Peach</b>           | 0/33      | 7/06         | -1/63      | -0/68    | -1/63  | 1/47    | -1/63 | -1/63     | -1/63        |
| <b>Water grapes</b>    | 3/50      | 3/85         | -1/18      | -1/53    | -0/69  | -1/47   | -0/71 | -0/83     | -0/94        |
| <b>Dry grapes</b>      | -1/24     | -0/85        | -1/63      | 8/37     | -1/63  | 1/90    | -1/63 | -1/63     | -1/63        |
| <b>Strawberries</b>    | 0/24      | -1/63        | -1/63      | 0/87     | -1/63  | 3/06    | -1/63 | 4/00      | -1/63        |
| <b>Mulberry</b>        | 11/36     | -0/27        | -1/63      | -1/63    | -1/29  | -1/63   | -1/63 | -1/63     | -1/63        |
| <b>Barberry</b>        | -1/63     | -1/63        | 13/07      | -1/63    | -1/63  | -1/63   | -1/63 | -1/63     | -1/63        |
| <b>Pistachios</b>      | -1/63     | -0/09        | -1/63      | -1/63    | -1/63  | -1/63   | -1/63 | 11/53     | -1/63        |
| <b>Water Almond</b>    | 1/71      | -1/20        | 2/58       | -1/30    | -0/10  | -0/27   | 1/34  | -1/34     | -1/42        |
| <b>Dry Almond</b>      | 8/17      | -1/34        | 2/29       | -1/14    | -1/63  | -1/44   | -1/63 | -1/63     | -1/63        |





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|                               |       |       |       |       |       |       |       |       |       |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>Walnut</b>                 | 1/39  | 2/20  | -1/12 | 1/22  | -0/28 | 1/13  | -1/54 | -1/55 | -1/47 |
| <b>Hazelnut</b>               | 12/27 | -1/63 | -1/37 | -1/63 | -1/63 | -1/10 | -1/63 | -1/63 | -1/63 |
| <b>Elaeagnus Angustifolia</b> | 10/44 | -1/63 | -1/22 | -0/25 | -1/63 | -0/80 | -1/63 | -1/63 | -1/63 |
| <b>Hawthorn</b>               | 13/07 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 |
| <b>Jujube</b>                 | -1/63 | -1/63 | 13/07 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 |
| <b>Olive</b>                  | -1/63 | 8/13  | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 | -0/03 | 1/71  |
| <b>Citrus</b>                 | -1/63 | -0/13 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 | 11/57 |
| <b>Pomegranate</b>            | -1/63 | 0/32  | -1/58 | -1/63 | -1/63 | -1/62 | -1/63 | 10/87 | -1/46 |
| <b>Fresh figs</b>             | -1/62 | -0/89 | -1/63 | -1/63 | -1/63 | -1/63 | -1/63 | -1/30 | 11/99 |

**Table 4: Distance matrix of horticultural productions (source: researcher)**

|                     | <b>Brojuerd</b> | <b>Khoram Abad</b> | <b>Aligodarz</b> | <b>Selseh</b> | <b>Dorood</b> | <b>Delphan</b> | <b>Azna</b> | <b>Koohdash t</b> | <b>Pole Dokhtar</b> |
|---------------------|-----------------|--------------------|------------------|---------------|---------------|----------------|-------------|-------------------|---------------------|
| <b>Brojuerd</b>     | 0/00            | 8/98               | 10/06            | 10/15         | 10/96         | 10/89          | 11/64       | 10/20             | 10/44               |
| <b>Khoram Abad</b>  | 8/98            | 0/00               | 4/54             | 4/72          | 6/28          | 6/16           | 7/40        | 4/84              | 5/32                |
| <b>Aligodarz</b>    | 10/06           | 4/54               | 0/00             | 1/28          | 4/34          | 4/17           | 5/84        | 1/67              | 2/77                |
| <b>Selseh</b>       | 10/15           | 4/72               | 1/28             | 0/00          | 4/15          | 3/97           | 5/70        | 1/07              | 2/46                |
| <b>Dorood</b>       | 10/96           | 6/28               | 4/34             | 4/15          | 0/00          | 1/21           | 3/91        | 4/01              | 3/34                |
| <b>Delphan</b>      | 10/89           | 6/16               | 4/17             | 3/97          | 1/21          | 0/00           | 4/09        | 3/82              | 3/11                |
| <b>Azna</b>         | 11/64           | 7/40               | 5/84             | 5/70          | 3/91          | 4/09           | 0/00        | 5/60              | 5/14                |
| <b>Koohdash t</b>   | 10/20           | 4/84               | 1/67             | 1/07          | 4/01          | 3/82           | 5/60        | 0/00              | 2/22                |
| <b>Pole Dokhtar</b> | 10/44           | 5/32               | 2/77             | 2/46          | 3/34          | 3/11           | 5/14        | 2/22              | 0/00                |

**Table 5: The shortest distances in horticultural productions (source: researcher)**

| <b>Cities</b>      | <b>Shortest</b>  | <b>Shortest 2</b> |
|--------------------|------------------|-------------------|
| <b>Brojuerd</b>    | Khoram Abad 8/98 | Aligodarz 10/06   |
| <b>Khoram Abad</b> | Aligodarz 4/54   | Selseh 4/72       |
| <b>Aligodarz</b>   | Selseh 1/28      | Koohdash t 1/67   |
| <b>Selseh</b>      | Koohdash t 1/07  | Aligodarz 1/28    |
| <b>Dorood</b>      | Delphan 1/21     | Pole Dokhtar 3/34 |
| <b>Delphan</b>     | Dorood 1/21      | Pole Dokhtar 3/11 |
| <b>Azna</b>        | Dorood 3/91      | Delphan 4/09      |





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|                     |                |                |
|---------------------|----------------|----------------|
| <b>Koohdasht</b>    | Selseleh 1/07  | Aligodarz 1/67 |
| <b>Pole Dokhtar</b> | Koohdasht 2/22 | Selseleh 2/46  |

**Table 6: Ideal values in horticultural productions (source: researcher)**

|              | <b>Appl e</b> | <b>Pears</b> | <b>Quince</b>            | <b>Sour cherry</b> | <b>Cherry</b> | <b>Differe nt plums</b> | <b>Aprico ts</b> | <b>Peaches</b> | <b>Nectarin e</b> |
|--------------|---------------|--------------|--------------------------|--------------------|---------------|-------------------------|------------------|----------------|-------------------|
| Ideal amount | 6/98          | 5/10         | 10/40                    | 6/33               | 10/62         | 5/36                    | 7/20             | 6/68           | 4/83              |
|              | Peac h        | Water grapes | Dry grapes               | Strawb erries      | Mulbe rry     | Barberry                | Pistach ios      | Water Almond   | Dry Almond        |
| Ideal amount | 7/06          | 3/85         | 8/37                     | 4/00               | 11/36         | 13/07                   | 11/53            | 2/58           | 8/17              |
|              | Waln ut       | Hazel nut    | Elaeagn us Angusti folia | Hawth orn          | Jujube        | Olive                   | Citrus           | Pomegranate    | Fresh figs        |
| Ideal amount | 2/20          | 12/27        | 10/44                    | 13/07              | 13/07         | 8/13                    | 11/57            | 10/87          | 11/99             |

**Table 7: values of development pattern for horticultural productions (source: researcher)**

| <b>Cities Fruits</b> | <b>Brojuer d</b> | <b>Khora m Abad</b> | <b>Aligoda rz</b> | <b>Selsel eh</b> | <b>Doroo d</b> | <b>Delph an</b> | <b>Azna</b> | <b>Koohdas ht</b> | <b>Pole Dokht ar</b> |
|----------------------|------------------|---------------------|-------------------|------------------|----------------|-----------------|-------------|-------------------|----------------------|
| Pears                | 13/84            | 21/59               | 45/31             | 0/00             | 42/45          | 29/24           | 43/01       | 30/95             | 45/31                |
| Quince               | 0/00             | 135/34              | 144/83            | 144/19           | 115/58         | 141/63          | 138/47      | 138/47            | 137/84               |
| Sour cherry          | 0/00             | 58/31               | 63/48             | 6/01             | 60/01          | 60/01           | 61/54       | 58/88             | 62/89                |
| Cherry               | 0/00             | 136/80              | 150/25            | 143/64           | 125/33         | 142/73          | 149/71      | 146/27            | 148/78               |
| Different plums      | 10/56            | 0/00                | 47/93             | 23/03            | 37/50          | 45/37           | 48/63       | 43/87             | 46/90                |
| Apricots             | 53/11            | 37/43               | 76/12             | 70/71            | 0/00           | 73/09           | 64/44       | 77/96             | 77/65                |
| Peaches              | 0/00             | 29/90               | 67/16             | 53/34            | 51/87          | 51/15           | 68/88       | 67/85             | 68/85                |
| Nectarine            | 4/75             | 0/00                | 40/16             | 28/62            | 27/07          | 27/07           | 41/78       | 39/63             | 41/37                |
| Peach                | 45/17            | 0/00                | 75/51             | 59/89            | 75/51          | 31/24           | 75/51       | 75/51             | 75/51                |
| Water grapes         | 0/12             | 0/00                | 25/26             | 28/90            | 20/57          | 28/23           | 20/73       | 21/86             | 22/95                |





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|                        |         |         |         |         |         |         |         |         |         |
|------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Dry grapes             | 92/35   | 84/96   | 100/04  | 0/00    | 100/04  | 41/89   | 100/04  | 100/04  | 100/04  |
| Strawberries           | 14/10   | 31/73   | 31/73   | 9/79    | 31/73   | 0/88    | 31/73   | 0/00    | 31/73   |
| Mulberry               | 0/00    | 135/26  | 168/96  | 168/96  | 160/19  | 168/96  | 168/96  | 168/96  | 168/96  |
| Barberry               | 216/35  | 216/35  | 0/00    | 216/35  | 216/35  | 216/35  | 216/35  | 216/35  | 216/35  |
| Pistachios             | 173/20  | 134/85  | 173/20  | 173/20  | 173/20  | 173/20  | 173/20  | 0/00    | 173/20  |
| Water Almond           | 0/76    | 14/25   | 0/00    | 15/00   | 7/18    | 8/11    | 1/54    | 15/35   | 15/99   |
| Dry Almond             | 0/00    | 90/47   | 34/62   | 86/78   | 96/16   | 92/35   | 96/16   | 96/16   | 96/16   |
| Walnut                 | 0/65    | 0/00    | 10/98   | 0/96    | 6/12    | 1/13    | 13/97   | 14/04   | 13/46   |
| Hazelnut               | 0/00    | 193/40  | 186/03  | 193/40  | 193/40  | 178/80  | 193/40  | 193/40  | 193/40  |
| Elaeagnus Angustifolia | 0/00    | 145/74  | 135/87  | 114/17  | 145/74  | 126/33  | 145/74  | 145/74  | 145/74  |
| Hawthorn               | 0/00    | 216/35  | 216/35  | 216/35  | 216/35  | 216/35  | 216/35  | 216/35  | 216/35  |
| Jujube                 | 216/35  | 216/35  | 0/00    | 216/35  | 216/35  | 216/35  | 216/35  | 216/35  | 216/35  |
| Olive                  | 95/28   | 0/00    | 95/28   | 95/28   | 95/28   | 95/28   | 95/28   | 66/53   | 41/20   |
| Citrus                 | 174/25  | 136/70  | 174/25  | 174/25  | 174/25  | 174/25  | 174/25  | 174/25  | 0/00    |
| Pomegranate            | 156/17  | 111/33  | 154/85  | 156/32  | 156/32  | 155/97  | 156/32  | 0/00    | 151/93  |
| Fresh figs             | 185/30  | 165/76  | 185/56  | 185/56  | 185/56  | 185/56  | 185/56  | 176/67  | 0/00    |
|                        | 1452/32 | 2362/64 | 2477/44 | 2622/55 | 2775/64 | 2752/14 | 2968/75 | 2575/31 | 2582/85 |
| C <sub>io</sub>        | 38/11   | 48/61   | 49/77   | 51/21   | 52/68   | 52/46   | 54/49   | 50/75   | 50/82   |

**Table 8: The degree of development of the cities for horticultural productions (source: researcher)**

| Rank | Cities       | C <sub>io</sub> | F <sub>i</sub> |
|------|--------------|-----------------|----------------|
| 1    | Brojuerd     | 38/11           | 0/648          |
| 2    | Khoram Abad  | 48/61           | 0/827          |
| 3    | Aligodarz    | 49/77           | 0/846          |
| 6    | Selseleh     | 51/21           | 0/871          |
| 8    | Dorood       | 52/68           | 0/896          |
| 7    | Delphan      | 52/46           | 0/892          |
| 9    | Azna         | 54/49           | 0/927          |
| 4    | Koohdasht    | 50/75           | 0/863          |
| 5    | Pole Dokhtar | 50/82           | 0/864          |





## Structural Analysis of Odes Praising the Prophet Muhammad in the Mamluk Era

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Received: 23 Mar 2015

Revised: 24 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

Many poets have expressed their fascination and mania to the Prophet (PBUH) in different ways since the beginning of Islam. Odes praising the Prophet have changed over the centuries. With the rise of Mamalik, literary and cultural transformation was created in various fields, especially in the area of poetry. Mamalik rise in Islamic history goes back to the Abbasid period. Ayoubian appealed to them widely so that they took the reins of authority in Egypt. After the establishment of Bahriya Mamalik and Borjiya Mamalik, they ruled Egypt, Syria and the Hijaz nearly three centuries. Religious poetry revolved and developed, especially praise to the Prophet, in this era and it was manifested among other literary techniques as an independent literary technique. In this situation, almost all poets have written a praise poem about the character of Mohammad (PBUH); some poets have allocated a whole collection of poems to this technique. Odes praising the Prophet in this era had developed themes, homogeneous intentions, and complete construction. Prophetic odes are the whole translation of prophetic tradition and the longest poetic odes of Mamluk era. The poets of this age moved away from imitation and began to rearrange form and content of the prophetic tradition and style with the most beautiful garments. In addition to following the style of the leading poets in this regard, they invented introductions and compose different meanings in poetry; the most frequent examples are the miracles of the Prophet Muhammad. Poets' particular attention to epiphonema and dedication of best lines to this part is another sign of prophetic praising odes. This article tries to study foundation and implications of the Mamluk era



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odes in praise of the Prophet Muhammad and the quality of panegyric composers' art using historical analysis.

**Key words:** The structure of the odes, praise of the Prophet, the Mamluk era.

**INTRODUCTION**

Undoubtedly, ode is one of the most significant poetic ends having accompanied Arab poetry because panegyrists have been at the center of king's attention in every era; this led to the flourishing of this style. Nevertheless, due to disclaiming this style by Mamluki kings and rulers, its voice was silenced; thus, another type of poetry that praised religious elements, especially the Prophet, emerged. Odes praising the Prophet of Islam have passed different evolutionary stages in the history of Arabic literature; according to most scholars, it has emerged as a new poetic style in the age of Mamluki so that almost all poets have written a praise poem about the character of Mohammad (PBUH); some poets have allocated a whole collection of poems to this technique (Salam, 1959). Mamalik rise in Islamic history goes back to the Abbasid period. Ma'moon (825) was the first who bought Turk Mamalik from different countries and employed them in his army. Ayoubian appealed to them widely so that they took the reins of authority in Egypt (Ibn Taghezi Bardi, 1939). After the establishment of Bahriya Mamalik (1250-1382) and Borjiya Mamalik (1382-1715), they ruled Egypt, Syria and Hijaz nearly three centuries.

Due to the multitude number of panegyrists of Prophet and their great number of poems, the poets have been divided into three groups, the intellectual, mystic and social representatives of Mamluk society and their poems; in this manner, they are a detailed representation of cultural and technical characteristics of the era. However, other innovative poets of the age have not been disregarded and some instances are mentioned from these poets.

Boussayri (1296) the most leading panegyrists of Mohammad, Ibn Nubatah (1385) the master of oriental poets, Ibn al-Wardi (1448) the Syrian scholar, Al-Shabab ol- Zarif (1289) the noble Iraqi poet of his age, Sarsari (133) who is famous for his numerous poems and long odes and is regarded as the pioneer of this style, and Safi al-Din Helli (1337) the leader of rhetoric have been included into this study. It is necessary to say that each poet was a master in literary, religious and historical sciences in addition to his poetic talent and nature. Thus, they were away from technical and cultural degeneracy that may affect ignorant and unjust scholars.

For this purpose, the structure of this type of poems in Mamluki era should be investigated and their elements should be described in details for better understanding and explanation of the features. False and negative impression of some researchers about the culture and literature of the age puts some challenging questions before us: did the prophetic prasiers imitate the styles of early Islam in their odes or they resisted against the old fashions and began an innovation. What are the innovative techniques used by them? What are the differences between the theme of their odes and the theme of imitated odes in the history of Arabic literature?

What was said is evidence of the importance of addressing this issue, which has been blazing from the dawn of Islam to the present time and despite its high position it has not been given due attention by researchers and it has not gained its deserving position in the collection of Arabic Poetry to the extent that it can be named the "orphan literature".

This article aims to present an introduction at first. Then, it will study themes of prophetic praises using descriptive analysis; the final part will be a glance at this type of ode.





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## LITERATURE REVIEW

A scientific-initiative research is a sort of research over the literature of which the researcher has mastery. To observe the principles of academic integrity it is needed to briefly mention the researches developed on this issue:

1. The book "Al-madaeh al-nabawiya fi Al-adab al-Arabi" edited by Zaki Mubarak is the first historical book about the Prophetic praise; it paved the way for other books in this style. However, the book is not a comprehensive and deep inclusion of the subject and it does not regard any difference between religious poetry and the Prophetic praise.
2. "Prophetic praises among Sarsari and Boussayri" edited by Mokhiymer Salih is another book in this regard. The author has explained the lives of these two poets in detail and he compares their poems in the fifth chapter of the book. The sixth chapter is dedicated to comparison of technical approaches in the poems of the poets including rhetoric figures such as pun; but it does not include linguistic techniques.
3. "Prophetic praises" by Mahmood Salem Mahmood is one of the important references about the praise of the Prophet. Since it has been a university thesis in its original form, the praises of the Prophet in the early Islam are concise. Then, it explains the main motivations for Prophetic praises and the effects of praise in poetic styles.
4. M.A. thesis of the author of this article titled "Prophetic praises of early Islam poets" defended in 1997 in Isfahan University and his Phd dissertation titled "Prophetic praises of Bahriya Mamluki era" defended in 2007 in Saint-Joseph University of Lebanon are another important references in the Prophetic praise style. As far as the researcher knows, it is the first Arabic study that covers both themes and styles of the Prophetic praises from early Islam to the end of Mamalik era.

### Structure of Odes Praising the Prophet

#### The prologue of Ode

It was conventional for poets to begin their odes by a prologue to the main subject. It is ordinary to begin poems by "Tashbib" or Taghazol" so that it has been used for a long time as a tradition and technique. In the era of the Umayyad and Abbasid, a revolution against previous customs had occurred by some poets including Komait Ibn Zeid Asadi (744), Bashar ibn Bord (748), Abo Navas\* (813), etc. They invited other poets to transformation and renewal of the methods and themes (Ibn Rashiq, 2001, Bakkar, 1979). With progress and development of literary in the era of the Fatimids, Ayoubian and Mamluk, introduction, or prologue, was an integral part of the structure of the odes. However, this introduction was not the main condition in praise of the Prophet so that some poets began the main subject without any introduction.

The number of lines of a prologue differs among different poets; sometimes, the number of lines of prologue was more than the main body of the poem.

Former poets and scholars of rhetoric paid much attention to prologue of their odes because it is the first audiences' encounter with the poem. Hazem Qartajani (1285) believed a good introduction is the best effort in making a poem. Introduction invites listener and audience to the poet and its place in poem is like beauty of forehead on the face that enhances the soul's appetite to continue the poem (Qartajani, 1966: 309). The same as Qartajani, Khatib Qazvini (1338) has also emphasized the importance of prologue and called it "براعة الاستهلال" (Qavini, 242). This is notable when the prologue has a close and accurate relation to the main subject like this verse by Boussayri:







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أَمِنْ تُذَكِّرُ جِيرَانَ بَدِي سَلَمٍ مَزَجَتْ دَمْعًا جَرَى مِنْ مُقَلَّةٍ بَدَمٍ

(Boussayri, 2002: 420)

However, these poets have used various prologues and methods. The prologues can be divided into two groups of imitative and innovative; it was established by panegyrist of the Prophet, especially Sarsari.

#### Imitative Prologues

Imitative prologues, which many poets were not able to free themselves from, are like the introductions expressed by old critics and historians of literature. There are many methods in the expression of this type such as passion, travel history and natural disasters, and admonitions. The poets of this age made changes in this approach and associate their praise to the admired person, i.e. Mohammad (PBUH). The poet's desire to the traces of beloved, description of travel, enthusiasm of the holy places, explaining the difficulties of traveling to Medina, asking forgiveness and intercession and other concepts had emerged.

Ironically, the panegyrist in the Mamluk period and even the recent period have imitated the traditions of early Islam period in the notions like the realization of the ruins of the beloved. Sarsari opens one of his odes by a prologue about ruins as description of the land of his beloved when he has left the land so that the land has been destroyed, the winds are blowing, and the sand are spread everywhere. The poet uses this method to add authenticity to his ode. In this situation, he travels to the holy land like the old poets who describe travel to the praised. As he meets the Prophet, he says:

لِمَنْ دِمْنٌ بِالرَّفَقَتَيْنِ أَرَاهَا مَخَا رَسَمَهَا طَوْلُ الْبَلَى وَعَفَاهَا

تَحْمَلُ عَنْهَا كُلَّ أَعْيِدِ أَنْسٍ وَلَمْ يَبْقَ إِلَّا عَفْرُهَا وَعَفَاهَا

فَأَضْحَتْ قَرَاهَا بَعْدَ طَوْلِ غَنَائِهَا يَنْعَمُ فِيهَا رِيْمُهَا وَطَلَاهَا

نَبِيٌّ أَطَاعَتْهُ الْكُنُوزُ فَلَمْ يَكُنْ لَهُ قَابِلًا بَلْ رَدَّهَا وَأَبَاهَا

(Sarsari, 1989)

After mentioning this prologue, the role of prologue in this type of poem will be studied.

#### Holy Places

Remembering the land of beloved is customary in Arabic literature, but the panegyrist have gradually replaced the holy places to the land of beloved. Although some scholars argue that the Egyptian poets were the first group who invented these arrangements (Hussain, 1964: 218), Sarsari and other panegyrist had used this method in their odes because the loving holy places had been emerged as in Sufi circles as an independent literary technique before the Mamluki era. For instance, Sarsari opens one of his odes by introducing Hijaz breeze as the revival of dead persons in the realm of love to describe rapturous people who have traveled to the holy land. Sarsari wrote:

مَا بَالُ أَنْفَاسِ النَّسِيمِ إِذَا سَرَتْ سَحْرًا عَلَى مَيْتِ الصَّبَابَةِ أَنْشَرَتْ

مَا ذَاكَ إِلَّا أَنَّهُمَا مَرَّتْ عَلَى رَيْدِ الْحِجَازِ وَبَانِهِ فَتَعَطَّرَتْ





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عَنْ عُرْفٍ مَنْ يَهْوَى بِصَدْقِ أَخْبَرَتْ      حَمَلَتْ إِلَى الْمَشْتِاقِ مِنْكَ رَسُولَهُ

(Sarsari, 1989)

This lovely and symbolic ode about enthusiasm for holy places and remembering the beloved has been imitated by other poets to the extent that it was established as an integral part of prophetic praises. This theme motivates a sense of joy in man and purifies his soul. As far as man is departed from his beloved land, the passion of his love will be higher. Like

إِلَيْكَ رَسُولَ اللَّهِ عُنْدِي نَوَازِعُ      مِنْ الشُّوقِ لَكِنْ دُونَ قَسْصِي مَوَانِعُ  
تُحْنُ إِلَيْكَ الرُّوحُ حَتَّى فَاقِدِ      عَدْتُهُ عَنِ الْأَحْبَابِ بِيَدِ شَوَاسِعِ

(Ibid: 617)

Describing desire to the holy lands in the poets of this age has different manifestations. For example, Ibn al-Wardi opened his praise of the Prophet by explaining the city of Prophet and its related subjects including the lovers in this city:

أَدْرُ أَحَادِيثَ سَلْعٍ وَالْحَمَى أَدْرُ      وَالْهَجَّ بِذِكْرِ اللّوَى أَوْ بَاتِيهِ الْعَطْرُ  
وَصِفَ قَبَابَ قِبا وَأَخْتَمَ بِطَيْبَةِ مَا      سَامَرْتِي فَهُوَ عُنْدِي أَطْيَبُ السَّهْرِ  
مَنَازِلُ كَسَبَتِ بِالْمُصْطَفَى شَرْفًا      بِأَفْضَلِ الْخَلْقِ مِنْ بَدْوٍ وَمِنْ حَضَرِ

(Ibn al-Wardi, 1986)

In addition, Shahab al-Din Mahmood (1325) that describes his sadness of parting moment opens his poem with a miserable mood in which his tears fall with every lightning and whine of doves:

رَأَى الرِّكَابَ تُحْدِي فَاثْتَنَى كَلْفًا      صَبَّ بَكَى أَسْفَاً وَالْبَيْنُ قَدْ أَرْفَا  
مُعْرَى بِحَبِّ الْجَمَى تَهْفُو جَوَانِحُهُ      إِنْ بَرَقَهُ لَاحٌ أَوْ قُمْرِيَّةٌ هَتْفَا  
يَكَاذُ بَفِضِي عَلَيْهِ فَرَطٌ لَوْعَتِهِ      إِذَا تَنَكَّرَ عَهْدًا بِالْجَمَى سَلْفَا

(Nabahani, 1974)

Scholars have admired this method in the opening of praises about the Prophet. By so doing poets intend to strengthen the internal and emotional link between the audience and the Prophet.

### Lyric

Along with the widespread use of imitative prologues of the Prophetic praises with focus on love to beloved theme, the Prophetic odes with structures that had most influence on the audience had been composed; however, they were different in theme and content. They were gradually been depleted from whatever was not worthy of the Prophet's character. Ibn Hejjeh (1433) says that a lyric that is composed for praising the Prophet obliges the poet to observe





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modesty and politeness, to be humble, and to compose lyric by remembering Sal', Ramah, Safhe Aqiq, Odhaib, Ghowair, La'la', and Aknafa Hajar (Ibn Hejjeh Hamawi, 1304 Hijri).

This issue is seen clearly in a lyrical arrangement by Ibn al-Wardi while he is praising the Prophet. He begins this ode by speaking of the pain of parting that made his heart hurt and in which he describes his tears of joy to the city of Medina and its inhabitants.

قَلْبُ كَوَاهِ الْبَيْنِ حَتَّى أَنْصَجَا      مَازَالَ فِي بَحْرِ الْغَرَامِ مُلْجَجَا  
وَمَدَامِعٌ سَحَّتْ وَمَا سَحَّتْ عَلَى      خَدَّ بَحْمُرَةٍ لَوْيَهَا فُذْ ضُرْجَا  
لَمْ لَا نُضْرَجُ أُنْمَعِي خَدِّي وَقَدْ      أَذْكَرْتُ ظِلًّا بِالْمَدِينَةِ سَجَسَجَا  
لِي بِالْحِجَازِ وَسَاكِنِيهِ مَآرِبُ      أَرْضٌ حَكَتْ حُلَّالَ الرَّيْبِ مُدْبَجَا

(Ibn al-Wardi, 1986)

Once, expressing affection and love for the Prophet (PBUH) is seen in in all lines of the ode. For example, Ibn al-Wardi's lyric initiates by this prologue:

بِأَيْمَنِ جِرْعَاءِ الْكَذِّيبِ خِيَامُ      لِهِنَّ عَلَيْنَا حُرْمَةٌ وَدِمَامُ

(Ibid: 257)

Ibn Nubatah has a beautiful prologue in one of his lyrics; it may be the most beautiful ode in his book of poems:

صَحَا الْقَلْبُ لَوْلَا نَسْمَةٌ تَتَخَطَّرُ      وَلَمَعَهُ بَرَقَ بِالْغَضَا تَتَسَعَّرُ  
وَذَكَرُ جَبِينِ الْبَابِلِيَّةِ إِذْ بَدَا      هِلَالُ الدُّجَى وَالشَّيْءُ بِاللَّيْلِ يُذَكَّرُ  
سَقَى اللَّهُ أَكْنَافَ الْغَضَا سَائِلِ الْحَيَا      وَإِنْ كُنْتُ أَسْفَى أَدْمَعًا تَتَحَدَّرُ

(Ibn Nubatah: 180)

Because of their abundant interest to praise written for the Prophet, some poets wrote their poems contrary to the ode Ka'b ibn Zohair's ode that describes his beloved sensory. Although the ode was not worthy of the position of the Prophet, some are completely unaware of the conditions in which he wrote the poem. For instance, Abolfazl ibn Tanokhi Halbi (1245) says in the prologue of his ode:

فِرْعَاءُ مَا مَسَّهَا غُسْلٌ وَلَا وَهْنَتْ      كَحَلَاءِ، مَا جَالَ فِي أَجْفَانِهَا مَيْلُ  
وَشَاحُهَا جَائِلٌ فِي خَصْرِهَا فَلَقُ      لَكِنْ نَعَصُ بِسَاقِيهَا الْخَالِخِيلُ  
مَا جَرَدَتْ سَيْفَ جَفْنٍ مِنْ لَوَاحِظِهَا      إِلَّا التَّنْبِيْتُ وَسَيْفُ الصَّبْرِ مَغْلُولُ

(Nabahani, 1974)





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There is not an agreement on this lovely approach to the Prophet among scholars, poets and experts. Nabahani says in this regard that although these poets are naughty and daring about the character of the Prophet, they follow a good manner in praising the Prophet. Then, he argues, "After a foul, do good work to remove its effects" (Ibid: 14/1). However, the separation of subjects does not seem reasonable because misbehave in any way is not worthy of the character of the Prophet.

Love and interest in the Prophet (PBUH) has also other reasons; it indicates the poet's affection to the personality of the Prophet and sacrifice to achieve him. This is manifested in the description of trip to the Prophet's land.

#### Departure

Pre-Islamic poets used to explain their trip and its difficulties to meet the beloved in the poems; it reflected their love to the praised or greed to reward. Admirers of the Prophet who are honest in their words follow the same method in their Prophetic odes. It should be noted that the poets were personally present in the caravan that was going to visit the Prophet. Shahab al-Din Mahmood articulates in the beginning of describing his trip to Hijaz:

أرْحِبُهَا فَعَدُّ مَلِّ الظَّلَامِ سُرَاهَا وَأَنْحَلَهَا بُعْدَ المَدَى وَبِرَاهَا  
سُرَى وَحَيْنِينَ وَاسْتِيَاقَ ثَلَاثَةَ بَرْتٍ لِحَمَاهَا بَرِي السَّهَامِ مَدَاهَا

(Ibid: 283/4)

In the prologue of his Prophetic praise, Sarsari described his horse and used it as a means to explain difficulties of his trip aiming to visit the grave of the Prophet (PBUH). This horse is eager to reach the land and the affection of his rider is more than it's. She also wrote:

ضَوَامِيرُ مِنْ طَوْلِ السُّرَى بَرَحَتْ بِهَا الْبَرَى فَبَرُّهَا الْحَتُّ مِنْ كُلِّ مُوجِبِ  
عَلَيْهَا رَجَالٌ فَارَقُوا حَفْضَ عَيْشِهِمْ فَمَا صَدَقْتُهُمْ عَنْكَ زَهْرَةَ زُخْرِفِ

(Sarsari, 1989)

#### Description of Nature

Like the past poets, these poets have described their long trips intuitive and precise, but this type of description is not like the hardship, violence and fear of desert in the poetry of the ancient emulator. Panegyrists give bright image of it; the image reflects unutterable joy of meeting with the Prophet (PBUH). In other words, they share their joy with nature. Some poets go beyond the description of journey and horse; they describe enchanting phenomena of nature directly; these phenomena bring peace, happiness, and vitality. For example, this poem by Safi al-Din Helli:

فِي رَوْحِ الصُّبْحِ أُمُّ يَأْفُوئُهُ الشَّفَقِ بَدَتْ فَبَهَّجَتْ الْوَرَقَاءَ فِي الْوَرَقِ  
وَفَاحَ مِنْ أَرْجِ الْأَزْهَارِ مُنْتَشِرًا نَشْرًا تَعَطَّرَ مِنْهُ كُلُّ مُنْتَشِقِ  
كَأَنَّ ذِكْرَ رَسُولِ اللَّهِ مَرَّ بِهَا فَأَلْغَسِيَتْ أَرْجًا مِنْ نَشْرِهِ الْعَبِقِ

(Safi al-Din Helli, 1962)





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This prologue indicates that the poet is going to convey a sense of inner peace to the soul of the audience. In addition, the poet could also expose his amazing artistic ability.

In this manner, the poets of prophetic praises show their artistic talent and excellence in description and creation of innovative images. On the other hand, they select bright and brilliant images of nature to reveal their inner states and happiness and to prepare them for meeting the beloved in a vigorous atmosphere.

#### Preaching and Admonition

This type of prologues stimulates the reader's interest in the Prophet and remembers him his sins; thus, the desire to hear advice and forgiveness is emerged in him. It is also seen in some former poets. Nabahani wrote many of this type of prologues; he invites other poets to this method, "Bringing advice and wisdom in the introduction of odes is good and noble because they are accepted by nature and religion" (Nabahani, 1974). An example of this prologue is seen in the ode written by Boussayri:

وَأَفَاكَ بِالذَّنْبِ الْعَظِيمِ الْمُذْنِبُ      خَجَلًا يُعَفِّفُ نَفْسَهُ وَيُؤْتِبُ  
لَمْ لَا يَسْتَوِبُ ذَمُّوعَهُ بِدِمَائِهِ      ذُو شَيْبَةٍ عَوْرَاتِهَا مَا نُخْضِبُ  
يَسْتَغْفِرُ اللَّهُ الذُّنُوبَ وَقَلْبِهِ      شَرَهَا عَلَى أُمَّتِهَا يَتَوْتِبُ  
ضَاقَتْ مَذَاهِبُهُ عَلَيْهِ فَمَا لَهُ      إِلَّا إِلَى حَرَمٍ بَطْنِيَّةٍ مَهْرَبُ

(Boussayri, 2002)

Panegyrist had not just emulated the imitative prologues, but they present new methods in the prologues to make their odes worthy and proper for the position of the Prophet (PBUH). This effort is called innovative prologues.

#### Innovative Prologues

This type of prologue contains many subjects including hallelujah, praise, and prayer of the Lord, crying for the youth, repent, asking the intercession of the Prophet, love to Mohammad, responding to questions of Christians and Jews, and the direct praise of the Prophet. They were not common among former panegyrist.

#### Commemorate God

An example of one of the innovative prologues is Boussayri's poem about the fire of Haram al-Sharif that begins by praising God and expressing submission to destiny; he says:

إِلَهِي عَلَى كُلِّ الْأُمُورِ لَكَ الْحَمْدُ      فَلَيْسَ لِمَا أَوْلَيْتَ مِنْ نِعَمٍ حَدُّ  
لَكَ الْأَمْرُ مِنْ قَبْلِ الزَّمَانِ وَبَعْدَهُ      وَمَا لَكَ قَبْلُ كَالزَّمَانِ وَلَا بَعْدُ

(Boussayri, 2002)





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#### Regretting the Youth

Crying and sigh for the young days and expressing remorse for the shortcomings that poets have committed in the presence of God are another theme in the prologues while crying for the youth is seen in the poems of Abu Tamam (Atwan: 237/1). Thus, some Mamluki poets have developed these poems to be suitable for the presence of the Prophet. It is remarkable when the prologue is about nearing death or asking forgiveness; Sarsari wrote:

مَا بَيْنَ فُرْبٍ وَيُعَادِ وَيَلِيَّ      وَيَبِينُ لَيْتَ وَلَعَلَّ وَعَسَى  
ضَاعَ زَمَانِي وَوَهَتْ شَيْبَتِي      وَضَوَّحَ الْمُخْضَرُ مِنْهَا وَرَوَى  
يَا وَيْحَ عَيْدٍ ذَهَبَتْ أَوْقَاتُهُ      مُسْتَعْرِقَاتٍ فِي جِهَالَاتِ الْهَوَى  
يَسْعَى إِلَى الْأَثَامِ جَدْلَانٍ وَقَدْ      أَحْصَى عَلَيْهِ الْكَاتِبَانِ مَا سَعَى

(Sarsari, 1989)

#### The Prophetic Love

Sincere love to the Prophet is one of the most prominent prologues excogitated by panegyrist in Mamluki era. This is a mystical concept that represents sublime and artistic themes of these poets. Sarsari composed:

شَوَاهِدُ قَلْبِ الْحُبِّ لَا تَقْبَلُ الرَّشَا      فَكَيْفَ قَبُولُ النَّصِيحِ مِنْ كَاثِحٍ وَشَا  
أَمَا فِي الْهَوَى الْعُذْرِيَّ عُدْرًا لِنَبِيِّ      إِذَا لَاحَ بَرَقَ مِنْ تِهَامَةٍ أَجْهَسَا  
مَنْى يَرِدُ الْمَاءَ النَّمِيرَ مَدْ خَلَا      فَيُنْقَعُ مِنْ وَرْدِ الصَّفَا غَلَّةَ جَيْشَا  
وَيَنْهَلُ مِنْ مَاءِ بَطْنِيَّةِ حَائِمٍ      يُرَوِي فُوَادًا نَحْوَهَا مُتَعَطِّشَا

(Ibid: 249)

#### Direct Praise

It was not respectful for some poets to begin their poems by imitative prologues because

They regarded it as an insult to the Prophet. In this regard, contrary to common customs they did not digress but went to the main issue, praising the Prophet, directly. A poem by Safi al-Din Helli is another instance of the poems about the birth of the Prophet which start without common prologues:

خَمِدَتْ لِفَضْلِ وَلَادِكِ النَّبِيرَانُ      وَأَشْتَقُّ مِنْ فَرَحِ بَكَ الْإِيْوَانُ

(Safi al-Din Helli, 1962)

In short, prologues of odes in Mamluki era were in diverse styles and methods and so -the poets had the choice to follow former poets in Islamic format or make innovative prologues. So two camps are formed. Some oppose innovative prologues; others oppose the imitative ones and praise the Prophet directly. In this manner, direct addressing the issue empties the ode from pickwickian and redundant words. After a brief introduction to the types





of prologues, the main topics of odes will be studied. The researcher tries to investigate the main infrastructure of topics with emphasis on meanings and themes.

### Themes and Topics of Odes

An investigation of odes praising the Prophet in the Mamluki age shows that the odds are a reflection of the face of religious, literary, literal, historical, and various developments of the period. They extracted religious culture from Qur'an, the Prophet's sayings, and other references of the religion. In styles and meanings, they were influenced by literary and historical heritage of ancestors and particular social and political situation of the Mamluk community.

### Praising the Prophet's Character

These cultures provide a good source for prophetic praises. The Prophet's character maybe is the most striking subject having been described and discussed in detail by poets because this subject requires the poet's knowledge, precise awareness, sincerity and courage. Here, the researcher focuses on the most prominent themes having been described by poets due to their mastery and awareness. Since it is not possible to explain all dimensions of Mohammad's character that has been described by poets, the most important ones will be discussed.

Pure nature, the authenticity of the Prophet, the story of his birth and the miracles and extraordinary events related to it, such as the crumbling of Ivan Kasra and extinguishing of Iranian fire temples are important subjects; Boussayri comments as the following:

أَبَانَ مَوْلِدُهُ عَن طَيْبِ عُنْصُرِهِ يَا طَيْبَ مُبْتَدَأِ مَنَّهُ وَمُخْتَلَمِ  
وَبَاتِ إِيوَانَ كِسْرَى وَهُوَ مُنْصَدِّعٌ كَثَمَلِ أَصْحَابِ كِسْرَى غَيْرِ مُلْتَمِ

(Boussayri, 2002)

Many poets have spoken of the Prophet's spiritual and material virtues and appearances; they admire his high moral and beauty. Sarsari says:

أَكْمَلُ الْعَالَمِينَ عِلْمًا وَإِيمَانًا وَإِيمَانًا وَاجْتِهَادًا وَزُهْدًا  
وَأَشَدُّ الرِّجَالِ بَأْسًا إِذَا مَا أَكْتَتِ الْحَرْبُ بِالْأَسِنَّةِ وَهَذَا

(Sarsari, 1989)

In addition to expressing the greatness of the spiritual qualities of the Prophet, poets have described his physical attributes and appearance. Ibn al-Wardi described his beautiful smile, the good looking, dignity and good behavior. He claims:

إِذَا تَبَسَّمَ لَيْلًا قُلُ لِمَبْسَمِيهِ يَا سَاهِرَ الْبُرْقِ أَيْقِظَ رَاقِدَ السَّمْرِ  
الْإِنْسُ وَالْجَنُّ يَا أَبِي الْوَرَى أَتِيَا يَسْتَجِدِيَانِكَ حُسْنَ الدَّلِّ وَالْحَوَرِ

(Ibn al-Wardi, 1986)





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#### The Prophet's Jihad

Jihad is another recurrent theme with a high position in the odes. Poets have described the courage and bravery of the Prophet (PBUH) so detailed and accurate based on the Quran and the books of tradition. Ibn Jaber (1999/780) says:

يَدَا يَوْمَ بَدْرَ وَهُوَ كَالْبَدْرِ حَوْلَهُ      كَوَاكِبُ فِي أَفْقِ الْمَوَاكِبِ تَنْجَلِي  
وَجَبْرَيْلُ فِي جُنْدِ الْمَلَائِكِ دُونَهُ      فَلَمْ تُعْنِ أَعْدَاؤُ الْعَدُوِّ الْمَخْدَلِ  
رَمَى بِالْحَصَى فِي أَوْجِهِ الْقَوْمَ رَمِيَةً      فَشَرَدَهُمْ مِثْلَ النِّعَامِ الْمَجْفَلِ

(Nabahani, 1974)

#### Miracles

Miracles of the prophet are most frequent themes of odes praising him; but the most remarkable ones are Asra and Miraj story. Many poets including Boussayri, Sarsari, Ibn Nubata et al have composed poems in this regard. Ibn Nubata says in one of his odes:

وَحَازَ سَهْمَ الْمَعَالِي حِينَ كَانَ لَهُ      مِنْ قَابِ قَوْسَيْنِ ثَنُوبِيَّةً وَتَنُوبِلِ  
عَلَى الْبُرَاقِ لَوْجَهُ الْبُرْقُ مِنْ حَجَلِ      وَرَجُلٌ مَسْعَاهُ تَلْوِينٌ وَتَشْكِيلِ  
لِسِدْرَةِ الْمُنْتَهَى يَا مُنْتَهَى طَلْبِي      مَا مِثْلُهُ يَا حِنَامَ الرُّسُلِ تَحْوِيلِ

(Ibn Nubata: 375)

#### Muhammadan Reality

This type of miracles has not been only a sign for proving the prophethood of Mohammad; but the poets have used them to express the superiority of Mohammad to other prophets. This subject is called Muhammadan reality. Boussayri wrote in his Hamziya ode:

كَيْفَ تَرَقَى رُفَيْكَ الْأَبْيَاءُ      يَا سَمَاءَ مَا طَاوَلْتَهَا سَمَاءُ  
لَمْ يُسَاوُوكَ فِي عِلَاكَ وَقَدْ حَا      لَنْ سَنَا مِثْلَكَ دُونَهُمْ وَسَنَاءُ  
إِنَّمَا مَتَّلُوا صِفَاتِكَ لِلنَّاسِ      سَ كَمَا مِثْلُ النُّجُومِ الْمَاءُ

(Boussayri, 2002)

Sarsari who pointed out his prophethood before the birth of Adam says:

مِنْهَا نُبُوَّتُهُ وَأَدَمُ طَيْبَتُهُ      وَازْدَادَ نُورًا حِينَ حَلَّ بِصَلْبِهِ  
وَرَأَى بَعْيَيْنِهِ عَلَى الْعَرْشِ اسْمُهُ      فَدَعَا بِهِ حِينَ اسْتَقْبَلَ بِذَنْبِهِ

(Sarsari, 1989)







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#### The Intercession of the Prophet

When other prophets seek for his help, what should other people do? This fact was an incentive for poets to ask the Prophet's intercession for removing sins and meeting worldly and otherworldly needs. Al-Shabab al-Zarif resorts the Prophet at the end of one of his odes:

لي من ذنوبي ذنّبُ وأفرّ فعسى      شفاعة منك تُنجيني من اللّهب  
إليك وجهت أمالي فلا حُجبت      عن باب جودك إنّ الموت في الحُجب  
وقد دعوتك أرجو منك مكرمة      حاشاك حاشاك أن تدعى فلا تجيب

(Al-Shabab al-Zarif, 2004)

#### Defending Islam

The poets' desire to sacred places motivated their connection and attachment to the land of Islam and defend the Ummah of the Prophet. Thus, they resorted to the Prophet to solve problems and remove challenges. Sarsari says:

لِبلاغ حُجّته التي لا تُقطع      يا خير من برأ المهيمن وأرتضى  
أنتكو إليك وأنت تعلم فئنة      كادت لها صنم الصلاب تصدغ  
سلّ جبر أمتك الكسيرة إنه      لم يبق في قوس التجلد منزع  
مَحَقَّت طغاه الثرك أطراف القرى      فالمال نهب والمنازل بلقع

(Sarsari, 1989)

#### Praising Ahl al-Bait and Companions

The sublime position of the holy Prophet causes his friendship and praise of his Ahl al-Bait and companions. In every of his poems, Boussayri dedicated some lines to the praise of Ahl al-Bait. He says:

آل النبيّ ومن لهم بالمصطفى      مجد على السبع الطبايق مطبّب  
حزائم عظيمًا من ثراث نبوة      ما كان دونكم لها من يحجب  
الله حسبكم وحسبي إني      في كلّ مفضلة بكم أتّحسب

(Boussayri, 2002)





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#### Passion for Holy Places

Connection and fixation to the Prophet lead poets not only to respect every place in which the Prophet prayed but also to be eager to sacred places such as Ka'ba in Mecca, the holy places of Masjid Al Nabawi in Madinah, and wherever the Prophet worshiped God. They expressed their passion for these places so that this expression was established as a literary type related to praise odes. Sarsari's poem that chants holy places is a good example in this regard; these places are more than reality and are regarded as symbols.

حَيْتِكَ أَسْنَةُ الْحَيَا مِنْ دَارٍ      وَكَسْتِكَ حُلَّتْهَا يَدُ الْأَزْهَارِ  
وَتَعَطَّرَتْ نَفَحَاتُ تُرْبِكَ كُلَّمَا      فَضْنُ النَّسِيمِ لَطِيمَةَ الْعَطَّارِ

(Sarsari, 189)

The ode praising the Prophet contains a set of implications including the main subject, or the praise of the prophet. Moving from prologue to body and base of the poem depends on the ability of the poet. Some poets move from one part to other completely surprising and suddenly; this brings affectation in the speech; but some poets move so softly to the body that the readers or listeners do not feel strangeness or unfamiliarity. Interpretation of this transfer is easy only when one is aware of the tools used by the poet.

Transfer from parts of the body is known as "تخلص", or transfer. Ibn Hejeh Hamawi defines it as "A powerful poet moves from one concept to another one so smooth. This transfer is invisible, elegant, and fast so that the audience does not feel the transfer as the first meaning unless he engages in the second meaning. It is due to coordination, coherence and a perfect fit of two senses so that they are placed in one framework" (Ibn Hejeh Hamawi, 1304). This transfer shows the poet's ability and expertise in one of the criterion of poem's excellence; it was also criticised by critics in Mamluki age (Ibn al-Athir, 1939, Bakkar: 1979). Examples of this transfer are seen in many of the odes praising the prophet. For example, Safi al-Din Helli transfers the reader to the main body of the poem after describing nature and its colorful flowers.

كَأَنَّ نِكْرَ رَسُولِ اللَّهِ مَرَّ بِهَا      فَأَلَكْسَيْتِ أَرْجَاءَ مَنْ نَشْرَهُ الْعَيْقُ

(Safi al-Din Helli, 1989)

In a prologue of his odes, Sarsari transfer the subject from pray for rain on holy places to his beloved. While he is maintaining coordination and balance between the two components of ode, he wrote:

سَخَّتْ غَمَائِمُ أَنْوَارِ الْمَرْيَدِ عَلَى      قِيَابِهِ الْبَيْضِ سَخَا دُونَهُ السُّحُبُ  
فَهِىَ الشَّفَاءُ لِأَسْقَامِي وَسَاكِنُهَا      هُوَ الْحَبِيبُ الَّذِي أُبْغِي وَأَطْلِبُ

(Sarsari, 1989)

The main subjects or implications of praising the Prophet were very diverse so that the poets have covered all aspects of the Prophet's life and composed many poems in this regard. Therefore, communication and coordination among the components of the ode do not separate ending from the overall atmosphere of the ode. Ending should be firm, expressive of conscience feelings and high emotions springing from the heart of the poet.





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#### Ending of Odes

Ending of an ode is the final part remaining in the ears; it is effective in the audience because it was heard recently; therefore, it should be firm, complete, nice and beautiful to remain in the memories for a long time and to convey the meaning so that the desire for further speech is finished. If the prologue is the key to the ode, its ending should be the lock (Ibn Rashiq: 2001, Ibn Abi Esba': 2004, Hazem Qartajani: 1966).

Scholars of that age called it epiphonema. Prophetic odes should be ended according to the aim of the poet. Epiphonema of these poems is the ultimate hope of the poet and the end of revolution in emotions and passions for the Prophet in which the poet prays, asks for intercession, and repents. In the following poem of Ibn al-Wardi, the poet asks God to have mercy on the Prophet:

صَلَّى عَلَيْكَ اللَّهُ يَا خَيْرَ الْوَرَى مَا نَارٌ نُورٌ مِنْ صُرْبِكَ فِي الدُّجَى

(Ibn al-Wardi, 1986)

Waez Baghdadi also describes his sinful soul in an ode about the Prophet and asks for the prophet's intercession:

أَنَا رَجُلٌ ثَقَلْتُ ظَهْرِي بِزَلَّتِي وَمَنْ ذَلَّ يَأْوِي لِلشَّفِيعِ وَيَلْجَأُ  
أَعْنِي أَجْرَتِي ضَاعَ عُمْرِي إِلَى مَتَى بِأَثْقَالِ أَوْزَارِي أَرَانِي أَرْزَأُ  
إِذَا لَمْ يَكُنْ لِي مِنْ جَنَابِكَ شَافِعٌ شَفِيعْتُ وَمَا لِي غَيْرُ جَاهِكَ مَلْجَأُ

(Nabahani, 1974)

Therefore, the Prophetic panegyrists in Mamluki age paid much attention to the endings of their poems and placed the best distiches to this part. As some critics argue, it is worthy that the last distich of a poem to be the best and most effective one (Askari, 1952). Hence, panegyrists of the Prophet could describe some traits of the Prophet in their poems in this manner and finish their odes by asking intercession, prayer, and greeting from their hearts. It is noteworthy that scholars and experts of rhetoric regard the focus on the epiphonema of the poems as advantages of Prophetic odes.

#### CONCLUSION

This article has tried to present a brief picture of features of Prophetic odes in terms of basis and theme. In this regard, different prologues used by panegyrists of the prophet have introduced. The prologues are mostly imitative (with emphasis on themes like poet's desire to the traces of beloved, description of trip, and expression of love) and innovative poets (such as commemorate God, description of his attributes and names, crying for the youth, asking for intercession, and transfer to the main subject that is praise of the Prophet) of Mamluki era. Then, the researcher presented themes and subjects of odes that focus on the character of the Prophet, his traits, and virtues. The implications of praising the prophet is various so that the poets have extracted all relevant issues from different religious sources, cultural-intellectual heritage of Islamic age poets, and their own lives and make arrangements in poetry. The story of the Prophet's birth and related events, spiritual and material virtues and appearances, Jihad, miracles, Muhammadan reality, the intercession of the Prophet, praising the Prophet's Ahl al-Bait and companions, and passion for holy places are the most prominent and description of miracles are the most recurrent interlocutors of Prophetic odes. The next part was dedicated to epiphonema and devoting the best distiches to the ending of the





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poems. In addition, the multitude of images, great number of subjects, the power of fantasy, raging talent, and lexical and intellectual power of the prophet's panegyrist are other characteristics of this type of ode. They are causes of prosperity of this technique in Mamluki era.

#### Postscript

Although many critics regard Abu Noas as the leader of innovation in Arabic poetry, Komait is the founder of these innovations. However, Komait talks about the prophet's Ahl al-Bait instead of describing women and crying for the traces of love. He wrote:

طَرِبْتُ وَمَا شَوْقًا إِلَى الْبَيْضِ أَطْرَبُ      وَلَا لِعَيْبِ مَنِّي وَدُو الشَّيْبِ يَلْعَبُ

Nevertheless, Abu Nawas described wines and parties instead of describing his home:

صِفَةُ الطَّلُوبِ بِلَاغَةُ الْقَدَمِ      فَاجْعَلْ صِفَاتِكَ لِابْنَةِ الْكَرَمِ

(Bengar, Mubarak: 1935, Makhloof, 1967).

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## Investigation of Structural Relationship between Educational Enablers and Comprehension in Students in Fifth and Sixth Primary School in Yazd

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Received: 29Mar 2015

Revised: 27 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

This study aimed to investigate the structural relationship between educational enablers and comprehension in students in fifth and sixth primary school in Yazd. The research method was correlational with the aim of covariance analysis. The Statistic population includes all the boys and girls of the fifth and sixth primary school students in Yazd in 2014-15 academic years which 400 students selected by multistage cluster sampling. Research tools include: Reading motivation questionnaire of (Noelset al., 2000), questionnaire of academic engagement of (Fredricks et al., 2005), a component of interpersonal communication skills (emotional intelligent), and the questionnaire study skills of Virginia (Collie et al., 2002). Processing and data analysis were performed using spss21 and LISREL. The results showed that the direct effect of the external variable of comprehension on internal motivation is positive and significant while its effect on the lack of motivation is negative and significant and it did not improve significantly external motivation. Direct effect of the development of internal motivation on time management, concentration, test preparation, academic behavioral engagement, academic emotion engagement, and academic cognitive engagement is positive and significant while it did not have significant effect on comprehension, reading speed, manage test anxiety and test performance in reading comprehension test. The direct effect of extrinsic motivation progress on comprehension skills, test preparation, reading speed, and the management of test anxiety was negative and significant while its effect on academic emotion engagement, academic cognitive engagement, time management, concentration, and performance comprehension test was not significant effect. The direct effect of the non-motivation on concentration skills, comprehension, test preparation, and speed was positive and significant. The direct effect of the academic behavior engagement, management of test anxiety and



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performance of the reading comprehension test was negative and significant while it did not have significant effect on academic behavioral engagement, academic emotion engagement, academic cognitive engagement, and time management. The direct effects of academic behavioral engagement, academic emotion engagement, and academic cognitive engagement on performance in reading comprehension test were not significant.

**Key words:** previous reading performance, interpersonal skills, comprehension, achievement motivation, educational engagement.

## INTRODUCTION

Reading and comprehension is one of the key areas of educational practice because a huge part of our information and learning are obtained via learning skills. In other words, the ability to "read" can be considered as the one of the main conditions for success in today's society.

Reading and comprehension skills are the most important learning needs of students. Comprehension is the understanding the text and the interpretations and conclusions of school and non-school textbooks that make students familiar with ideas and new information and better way of thinking and teach them to live better. In other words, literacy, in its scientific means, is the mean by which infinite human experience stocks can be achieved.

The "reading ability" means reading with comprehension and understanding the meanings and concepts, words, phrases, sentences, and recognizing the concepts and values behind the text and finally getting the message that the author has written it using signs and verbal codes (Jabari and Khademi, 2009).

Theoretical models of empowerment and academic skills and academic achievement, all have three aspects of the characteristics of the learner, the learning environment and the learning quality and some of these models also have some empirical support (Diperna and Elliott, 2005). A number of experimental and theoretical models fail to show the relationship between the student variables that predict academic competence because they ignore motivation, previous progress and some students' skills such as interpersonal skills and study skills (Diperna and Elliott, 2002)

Academic enablers are the attitudes and behaviors that allow students to take optimal advantage of what they learned in the classroom and achievement motivation, interpersonal skills, study skills and academic engagement are among its components (Diperna and Elliott, 2002).

Structures achievement motivation is addressed to behaviors that are associated with moderate progress in learning. In general, achievement motivation is the internal force that guided learner to assess all aspects of its performance according to the highest standards, striving for success in performance and a pleasure to be associated with the position. (Shahny yeylagh et al., 2005; Nouhi et al., 2012) in his study concluded that with enhancement of academic achievement motivation, the educational success can increase.

Another factor influences achievement and comprehension is the study habits or skills of subjects. Skills and study strategies, including tacit and explicit thoughts and behaviors that are associated with success in learning and can be changed through educational interventions. These skills and strategies are defined as the activity, cognitive, emotional or behavioral process storage, retrieval and use of knowledge that facilitate learning. Study skills are the behaviors that reflect and try to facilitate the processing of new materials (Diperna and Elliott, 2000), Also, one of the variables associated with the academic performance of students is the academic engagement. Academic engagement





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shows attention and active participation in classroom activities and is defined by three factors. The first factor is academic behavioral engagement including engaging in educational activities, social or extracurricular program (Hughes et al., 2008)

The second factor is the emotional engagement that is defined as positive and negative reactions of students from the people and activities of the school. The third factor is cognitive engagement that the moreover investment activities of students in the academic abilities includes stimulation educational activities.

In addition, interpersonal skills are the most important component of human life from beginning until the death. Learning proper interpersonal relationships is important in the development of mental health, personality development, identification, increased job productivity, increased quality of life, self-actualization and compatibility. People who haveless interpersonal skills are less accepted by those around and encountered with more short-term and long-term challenges (Nouri Ghasem Abadi,1998).

#### The importance and value of research

The importance of reading comprehension in students' academic abilities led International Studies in the field of literacy development assess children's ability to read. The Progress in International Reading Literacy Study (PIRLS) is one of a series of studies in which the International Association of the Evaluation of Educational Achievement (IEA) performs it. The results of the study are crucial on the problems and deficiencies, improve the quality of their education and explore ways to improve literacy in students. In fact, this study provides context to better understand the problems for planners to involve appropriate strategies to improve the quality of learning involved. This test indicates that which opportunity should be provided to students in the process of understanding to make them more capable for understanding and recognizing text elements (Najafi Pazouki et al., 2013). However, what makes this study significant is that different researches were conducted in the relevant field, but by examining the literature it can be seen that the level of elementary students and taking into account important variables that influence the goals of the research has not been done therefore the need to research in this field is felt.

#### Empirical research background

(Shahrabadi et al., 2013), in a study investigated the relationship between approaches to learning and academic achievement of students of medical study and showed that the most important predictor of college GPA was deep approach.

(Nouhi et al., 2012) studied achievement motivation and its relationship with academic achievement in students of medicine, nursing and health care of Baghiato Allah University of Medical Sciences. The results showed that it appears in medical students can boost the success rate of students' achievement motivation increase they academic achievements.

(Khadivi and Vakili Mafakheri, 2011), in a study investigated the relationship between achievement motivation, locus of control, self-concept and academic achievement of high school students in the first year of the five educational areas in Tabriz.

(Baghdasaryans et al., 2010) examined the relationship between study styles, achievement motivation and time management techniques. Results showed that there is a significant relationship between time management and study of achievement motivation and time management of students. Correlation between the methods of surveillance has had the greatest effect on students' achievement motivation and time management.





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(Yousefi et al., 2009) examined the relationship between motivation and academic achievement of medical students. The results showed that the average academic motivation has significant relationship with achievement in basic science and clinical science GTA.

(Clarke and Dimartino (2004), concluded that without no conflict of education, learning does not occur, suggesting the importance of student in learning according to these researchers. (Chapman, 2003) concluded that the engagement of student can be defined as their participation in the school daily activities such as attending classes, doing homework class, and follow the instructions for the teacher in the class. (Peter and Paul, 2001) also showed that a positive emotional and social attitude, and parents tips about reading is effective in increasing the score of comprehension.

**RESEARCH METHODOLOGY**

This study is applied research and in the respect of descriptive method is correlational for the purpose of analysis of covariance matrix. The study population consisted of all the boys and girls of primary school students in the fifth grade and sixth Yazd 94-1393 academic year, with the multi-stage cluster sampling 400 students were selected as the sample (200 people both girls and boys).

Data instrument: reading motivation questionnaire (ILOS) (Noels et al., 2000), in the form of 21 question items were used to measure learning orientation. This scale has three subscales of the non-motivation, extrinsic motivation and intrinsic motivation. In the (Sheykholeslami and Khayer, 2006) study for the test of the reliability of the questionnaire, the retest method was used and reliability coefficients for these subscales are obtained 0.79, 0.78 and 0.70, respectively.

The questionnaire of academic engagement of (Fredricks et al., 2005) that includes the scale consists of three dimensions: behavioral, emotional and cognitive in the form of 15 itemsexamined the educational engagement. (Fredricks et al., 2005) to examine the reliability of the questionnaire, have calculated the Cronbach's alpha coefficients for each sub-scale and reported them as follows: cognitive engagement, 0.86, emotional engagement 0.82, behavioral engagement, 0.77.

The questionnaire of interpersonal communication skills has six items extracted from Ann-Bare emotional intelligence inventory. In (Shoja Heydari et al., 2011) study for the reliability of the questionnaire examination, the Cronbach's alpha reliability coefficient was used and the value for mentioned subscale was obtained 0.75 and Study Skills Inventory of "Virginia (Collie et al., 2002)," which consists of 32 items and 8 components: time management, focus, point-making, reading and comprehension, experimental test and test taking, speed reading, writing skills, stress management to examine reading skills. In the (Badeleh et al., 2012) for the reliability determination of the questionnaire, the Cronbach's alpha method was used and the reliability coefficient for the subscales was obtained 0.82. The above mentioned scales were scored in Likert scale.

Comprehension test were used to check students' comprehension of the questionnaire. These tests have two parts. In the following of the desired text, 8 questions with 4 options were presented.

Past performance of the person reading was calculated using the score has been recorded in the last year.





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## RESEARCH FINDINGS

### The model fitness test

In order to test the fitness of the model, the path analysis method was used. The results showed that the value of (RSMEA=0.075,  $p = 0.00$ ,  $df = 56$ ,  $\chi^2 = 171.75$ ) which suggests a relatively good fitness of the model in the population, the result of  $\chi^2$  division on the degrees of freedom is under 2 which confirms the relative fitness. Also to determine appropriate fitness model with data, suitability of indicators were used. The results showed that a Goodness of Fit Index (GFI) = 0.94, Adjusted Goodness of Fit Index (AGFI) = 0.87, Normed Fit Index (NFI) = 0.88, Non-Normed Fit Index (NNFI) = 0.83 and Comparative Fit Index (CFI) = 0.91, which represents a good fitness of model with data, especially CFI value that from the perspective of (Muller, 1999) should be above 0.9 and the from the view of (Weston and Gore., 2006) should be above 0.95 to have a good fitness with data because is not affected by the sample size. The Root Mean Square Error of Approximation should be ( $RMSEA \leq 0.06$ ) that in this study is between 0.06 to 0.09 and confirmed the relative fitness for the model.

### The results of the study hypothesis

**First hypothesis** the previous comprehension performance is a positive predictor of intrinsic motivation and performance in reading comprehension test and it is a negative predictor of external motivation and the lack of motivation.

The results showed that the direct effect of exogenous previous comprehension performance variables on intrinsic motivation is positive and significant ( $\gamma=0.31$ ,  $t=5.21$ ,  $p<0.01$ ), and on non-motivation is negative and significant ( $\gamma=0.15$ ,  $t=2.15$ ,  $p<0.05$ ), while it had no significant effect on the external motivation ( $\gamma=0.03$ ,  $t=0.58$ ,  $p>0.05$ ), and performance test comprehension ( $\gamma=0.02$ ,  $t=0.34$ ,  $p>0.05$ ).

**The second hypothesis** interpersonal skills are a positive predictor of intrinsic motivation and performance in reading comprehension test and it is a negative predictor of external motivation and the lack of motivation.

The direct effect of interpersonal skills in intrinsic motivation is positive and significant ( $\gamma=0.52$ ,  $t=7.13$ ,  $p<0.01$ ), and on non-motivation is negative and significant ( $\gamma=-0.19$ ,  $t=-2.4$ ,  $p<0.05$ ) while had no significant effect on the external motivation ( $\gamma=0.08$ ,  $t=1.43$ ,  $p>0.05$ ).

**The third hypothesis** the effect of intrinsic motivation on the study skills (time management, concentration, comprehension, test preparation, reading speed, test anxiety management), study engagement (behavioral, emotional, cognitive) and performance on the reading comprehension test is positive and significant.

Direct effect of Intrinsic motivation on the time management ( $\beta =0.61$ ,  $t=7.42$ ,  $p<0.01$ ), concentration ( $\beta =0.26$ ,  $t=3.37$ ,  $p<0.01$ ), test preparation ( $\beta =0.21$ ,  $t=2.55$ ,  $p<0.05$ ), academic engagement behavior ( $\beta =0.21$ ,  $t=2.55$ ,  $p<0.05$ ), emotional engagement of education ( $\beta =0.53$ ,  $t=6.8$ ,  $p<0.05$ ), cognitive conflict Education ( $\beta =0.71$ ,  $t=7.76$ ,  $p<0.01$ ) is positive and significant while it does not have significant effect on comprehension ( $\beta =0.12$ ,  $t=1.4$ ,  $p>0.05$ ), reading speed ( $\beta =0.08$ ,  $t=1.18$ ,  $p>0.05$ ), the management of test anxiety ( $\beta =0.05$ ,  $t=0.68$ ,  $p>0.05$ ), and the performance of the test comprehension ( $\beta =0.24$ ,  $t=0.73$ ,  $p>0.05$ ).

**The fourth hypothesis** the effect of external progress motivation on the study skills (time management, concentration, comprehension, test preparation, reading speed, and test anxiety management), study engagement





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(behavioral, emotional, and cognitive) and performance on the reading comprehension test is negative and significant.

The direct effect of external progress motivation on comprehension skills ( $\beta = 0.17$ ,  $t=3.5$ ,  $p<0.01$ ), test preparation ( $\beta = -0.19$ ,  $t=3.84$ ,  $p<0.01$ ), speed reading ( $\beta = 0.21$ ,  $t=4.04$ ,  $p<0.01$ ) was positive and on the test anxiety management ( $\beta = -0.15$ ,  $t=-2.99$ ,  $p<0.01$ ) was negative and significant while it had no effect on behavioral academic engagement ( $\beta = 0.06$ ,  $t=1.35$ ,  $p>0.05$ ), emotional academic engagement ( $\beta = 0.06$ ,  $t=1.35$ ,  $p>0.05$ ), cognitive academic engagement ( $\beta = -0.06$ ,  $t=-1.49$ ,  $p>0.05$ ), time management ( $\beta = 0.01$ ,  $t=0.12$ ,  $p>0.05$ ), concentration ( $\beta = 0.05$ ,  $t=0.94$ ,  $p>0.05$ ), and the performance test comprehension ( $\beta = -0.19$ ,  $t=-1.55$ ,  $p>0.05$ ).

**Fifth hypothesis** the effect of non-motivation on the study skills (time management, concentration, comprehension, test preparation, reading speed, and test anxiety management), study engagement (behavioral, emotional, and cognitive) and performance on the reading comprehension test is negative and significant.

The direct effect of non-motivation on concentration skills ( $\beta = 0.47$ ,  $t=5.36$ ,  $p<0.01$ ), comprehension ( $\beta = 0.64$ ,  $t=6.09$ ,  $p<0.01$ ), Test Preparation ( $\beta = 0.64$ ,  $t=6.09$ ,  $p<0.01$ ), and speed reading ( $\beta = 0.35$ ,  $t=4.55$ ,  $p<0.01$ ) was positive and significant and its effect on cognitive academic engagement ( $\beta = -0.19$ ,  $t=-2.6$ ,  $p<0.01$ ), test anxiety management ( $\beta = -0.52$ ,  $t=-5.63$ ,  $p<0.01$ ), and performance in comprehension test ( $\beta = -0.48$ ,  $t=-2.22$ ,  $p<0.01$ ) was negative and significant while it did not have significant effect on behavioral academic engagement ( $\beta = -0.02$ ,  $t=-0.26$ ,  $p>0.05$ ), educational, emotional conflicts ( $\beta = -0.07$ ,  $t=-1$ ,  $p>0.05$ ), and time management ( $\beta = -0.09$ ,  $t=-0.86$ ,  $p>0.05$ ).

**Sixth hypothesis** the effect of academic behavioral engagement on comprehension test performance is positive and significant.

The effect of academic behavioral engagement on comprehension test was not significant ( $\beta = -0.01$ ,  $t=-0.07$ ,  $p>0.05$ ).

**Seventh hypothesis** the effect of academic emotion engagement on comprehension test is positive and significant.

The effect of academic emotion engagement on comprehension test was not significant ( $\beta = -0.03$ ,  $t=-0.35$ ,  $p>0.05$ ).

**Eighth hypothesis** the effect of academic cognitive engagement on comprehension test performance is positive and significant.

The effect of academic cognitive engagement on comprehension test performance was not significant ( $\beta = -0.15$ ,  $t=-1.07$ ,  $p>0.05$ ).

#### The amount of explained variance

The results also showed that the lack of motivation, comprehension skills, reading speed and management of test anxiety explain in total 71% ( $R^2=0.71$ ) test comprehension performance. Intrinsic motivation variable explains in total 18% of the variance of academic behavioral engagement. Intrinsic motivation variable explains in total 13% of the variance of academic emotion engagement. Intrinsic motivation and lack of motivation explain in total 26% of the variance of academic cognitive engagement.

Intrinsic motivation variable explains in total 18% of study skills of time management. Intrinsic motivation and lack of motivation explain in total 25% concentration study skills. External motivation and lack of motivation explain in total 42% variance of reading comprehension skills. Intrinsic motivation variable, lack of motivation, and external



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motivation variables explain in total 45% of the variance in test preparation. External motivation and lack of motivation explain in total 45 % of the variance of speed reading. Variable external motivation and lack of progress in total explain 30 % the variance of test anxiety management. Past performance of individual skills and comprehension test performance explain in total 43% of the variance in internal achievement motivation.

**RESULT ANALYSIS**

Our first hypothesis is consistent with the results of (Fathi Ashtiani and Hasani, 2010), the researchers findings also showed that there are significant differences between successful and unsuccessful students in terms of the development of strategies of comprehension,.

The second finding of our study is consistent with the results of the research (Mirmousavi et al., 2008); Pakdaman Savodji et al., 2013; Wenzel et al., 2009).

The third finding of our study is consistent with research (Adler et al. 2005; Sobhaninejad and Abedi, 2006); (Yousefi et al., 2009; Nouhi et al., 2012). They showed in their study that variables such as self-efficacy and intrinsic motivation can predict the success rate of students in various areas such as reading, math, art, etc.

The fourth finding of our study is consistent with findings of (Whitehead, 2003; Wang and Guthrie, 2004). They reported in their study a negative correlation between external motivation and cognitive operations and stated that based on theory of (Deci and Ryan, 2000), any kind of external motivation that damages competence and independence of the individual has negative effect on his performance by reducing the intrinsic motivation. The study also showed that external motivation and its factors academic achievement of students in English-language component is very weak.

Five of our research findings are consistent (Baghdasaryans et al., 2010). His findings suggest that there is a significant relationship between the methods of study and time management, as well as the motivation (the non- motivation) with time management students.

Other findings of our research are inconsistent with the results of (Fouladvand et al., 2012). He in his own research found that students who educational engagement, attend regularly to school, focus on learning, are committed to the law school, earn higher grades and have better performance on standardized tests. In contrast, lack of academic engagement could have serious consequences for students such as low educational improvements, delinquent and deviant behaviors, the risk of failure and dropout. For this reason, the concept of educational engagement has attracted much attention, but it has not significant effect on comprehension performance in our study.

Moreover, the findings of our research are not consistent with (Clark and Dimartino, 2004) results. The researchers concluded that without the education engagement, learning does not occur, suggesting the importance of student engagement in learning. The finding of (Clarke et al., 1994) also showed that emotional engagement has significant effects on student achievement.

**SUMMARY AND DISCUSSION**

Factors affecting academic achievement during the last three decades have attracted more and more the expert's attention. Various research findings have shown that academic achievement is influenced by both the structures of knowledge and information processing, and also influenced by environmental factors such as family and self-regulation (Alibakhshi and Zare, 2010).



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According to Wallace, the inability of children in the meaning of words will cause word analysis problem and the understanding. These problems can be involved in the lack of ability to reason and the problem can be seen in many children with a lack of motivation to learn and since non-motivation will cause study weakness in all educational levels, therefore, to provide "opportunities for collaborative learning", "competitive climate mitigation and evaluation system in schools", "control of the students decrease" can increase the motivation of students and enhance their intrinsic motivation. To enhance intrinsic motivation at older ages also recommended by creating opportunities like the open questions, practical activities, exploratory learning methods and team working, make students goal-oriented to actively participate in the activities of studies and research. As a research-based class, teacher will have more opportunities to provide students with educational and research issues, Students are motivated to do these activities to flourish their creativity, not only just get the other extrinsic motivations to maintain pay content and learning lessons.

Also, research of (Kordnoqabi and Sharifi, 2005) have shown that life and interpersonal skills increases compatibility with the environment and makes individual to deal with an efficient and effective manner with a family environment, employment, education Social and address.

People with their intrinsic motivation consider themselves qualified, competent and self-control (Sobhaninejad, Abedi, 2006).

The self-orientation originated from intrinsic measures learning and academic success of the students. Therefore, self-oriented students who determine the academic goals for themselves have more educational success compared to when they have to choose one activity or to carry out the action for external reasons. Moreover, people who have intrinsic motivation are more likely to rely on their own judgment. This makes their attention to "activity" and not the quality and quantity they want to receive rewards as a result they will find higher success. But based on the findings, external motivation has no effect on the engagement of educational behavioral, emotional and cognitive engagement, time management, concentration, comprehension and test performance because the motivation and the intrinsic interest has significant effect on learning and durability and intrinsic motivation can lead to lasting progress more than extrinsic motivation.

Therefore stimulation of remote learners' motivation during the process of teaching and learning will be attracted their attention to the educational materials and finally to achieve effective learning and retention. Based on above mentioned points, the use of new methods and active learning in teaching - learning distance education system in Iran can be considered as a new horizon in our educational process.

It was noted that in the majority of studies that academic engagement has a significant impact on student learning, but in our study, given the key role of schools in preparing students to enter the community and social acceptance of different roles, it is necessary that the impact of teaching life skills on students to be confirmed and given more attention.

However, it seems that the trainings with positive effects are also effective on psychological variables such as self-esteem, cognitive and academic variables such as motivation and academic achievement.

**RECOMMENDATIONS**

To increase the motivation in students, conditions should be created to increase the autonomy and self-leadership and positive feedback. In this connection, competition creation, opportunity to think, investigation, research, practical, constructive criticism, comments and welcoming the guidelines and offers of students, the use of updated





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and timely promotional strategies to strengthen students' confidence and support them for extremists can be useful and practical.

Curricula and training programs and methods of teaching styles and learning strategies aligned to spend less time and energy, increases motivation and academic achievement.

Knowledge of the course objectives can be an effective factor in increasing motivation and progress.

The use of modern methods of teaching is the main factor influencing the increase in achievement motivation and learning.

Appropriate use of verbal encouragement and candid feedback, participation in learning by students, and the use of incentives to encourage timely feedback, the use of internal and external incentives is the influencing factor in the increase in achievement motivation and learning.

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## The Effect of Management Correct Profit Forecasts on Stock Return (Evidence from Tehran Stock Exchange)

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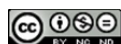
Received: 24 Mar 2015

Revised: 26 Apr 2015

Accepted: 29 May 2015

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### ABSTRACT

Forecasting helps investors to improve their decision making process and reduce their decision risk. One of the tools for interaction of managers and market is provision of information regarding company's profit forecast which reflects management forecast about future outlook, and it can affect company's stock market value. 103 companies among listed companies in Tehran Stock Exchange from 2009 to 2013 were selected using systematic elimination method as research sample. For testing hypotheses, multivariate regression method was used. Results of the research show that the number of management correct profit forecasts has no significant effect on company's stock return.

**Key words:** forecasted profit, Stock return, manager correct profit forecasts

### INTRODUCTION

Profit is one of the main and primary items of financial statements which always attract attention of users of financial statements. Investors, creditors, managements, employees of the company, analysts, and other users of financial statements use profit as a basis for taking decisions of investment and other decisions related to the company. Perhaps it can be said Forecast earnings per share is the main factor affecting stock price (Baginski and Hassel, 1997). A necessary feature for relevance of financial and economic information is usefulness in forecast. Forecast helps investors to improve their decisions and reduce risk of their decisions. One of the tools for interaction between managers of companies and market is provision of information on company's profit forecast which is provided at different time intervals to the capital market and thus the companies can influence the market behavior. Today



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forecast and management disclosure of profit is one of the main information sources for investors and analysts and since many of them take their decisions based on existing information, and on the other hand, profit forecast by managers have more value compared to current profits and book value of assets (Ota, 2002) and profits forecasted by the management is important criterion in evaluation of companies and influence on company's stock price, thus it should be expected that stock companies act carefully in their forecasts (Koch, 2002).

Considering economic role of management forecasts in financial markets and its impact on transparent and accurate reporting, this question is posed: does the number of management correct profit forecasts effect on company's stock Return?

**Theoretical Background and Literature Review**

Forecast is a key element in economic decision making. Investors, creditors, management and other individuals rely on forecasts in economic decision making. In addition to historical information, they also need information regarding future of economic units so that they reduce risk of their decision. One of this information disclosed out of financial statements is profit forecast by management of the unit, which reflects management forecast about future outlook and it is considered by the investors and stock market. Forecast of stock per share is a kind of corporate disclosure which provides information on expected profit of the company (Hirst et al., 2008).

Forecasted profits can be useful in the following cases:

Evaluate the profitability

Determining the current value of the shares or value of the company

Estimation of risk of investing in business

Risk assessment of concessional lending to business (Hendriksen and Vanberda, 1992).

The information produced by the company and thus the profit are based on the past events, but investors need information about the future. One of the existing views in this regards is provision of historical and current information by the business unit. Of course it should be in such a way that investors can do forecasts related to the future. The other view is that management does forecasts by having resources and facilities and increases efficiency of financial markets by public dissemination of these forecasts, because managements of the companies are among those users of financial statements which are present in the company and thus they have more information compared to external users. Also, they have access to information which is confidential for the company in addition to financial statements. In addition, information is provided for the managers quicker and in lower costs. Decision making about choosing out of two views seems difficult, because there is no acceptable understanding about the way of information processing by the investors and efficient market theory emphasizes extent and speed of financial information over stock price. Previous studies have come to contradictory results. But the dominant view is that dissemination of forecasts helps decision making for investment (Pownal et al., 1993).

Since information related to the profit and its forecast by the manager is more considered by the investors and other stakeholders compared to other information disseminated by the company, paying attention to forecasts of these information is necessary. On the other hand presence or absence of information regarding companies and their stocks can influence overall risk of the company. As the manager as an informed person depicts future of the company through forecast of profit per share for stakeholders, information risk is decreased and investors act more secure in evaluation of future cash flows (Foster, 1979).

Forecast plays significant role in economic decision making. At the economic institution level, investors, creditors, management and other users of financial statements rely on their or others forecasts and since most of users do not have direct access to financial information, inevitably they rely on the forecasts provided by the management.





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Importance of forecasted profit depends on its distortion to real value. The lower is this distortion; the forecast is more accurate (Rees and Sivaramakrishnan., 2007).

Management forecasts is one of the most efficient ways in which the manager can transfer his expectations to the market. Since managers have confidential information about future business plans, management forecasts can help investors to predict future profit better. Thus, future profit is more accurately reflected in the returns (Choi et al., 2008).

There are different methods for profit forecast. Forecast by the managers and forecasts based on time series models are among the major methods of forecast. Since most investors do not have awareness or access to time series models and they mostly rely on the profit forecasts by management, thus accuracy of forecasts of managers is highly important (Frankel et al., 1995).

(Williams, 1996) found that managers gain fame and credibility considering accuracy of their previous forecasts. Such accuracy is an indicator for believability of recent forecasts of the management.

Evidence indicates that companies which provider clear picture of their future are more acceptable in the stock market (Healy and Palepu, 2001). One way to depict such picture for the stakeholders is to disclose the predicted earnings per share.

Dissemination of this information ensures the capital market that the company acts objectively in information delivery (Leuz and Verrechia, 2000).

Managers reduce information asymmetry between managers, investors and analysts through clear and accurate disclosures about predicted earnings per share, thus reduced risk and increased company value is logical with increased voluntary disclosure. Earnings per share and its prediction as a fundamental analysis of the company can play significant role in the view of investors toward the expected return (Coller and yohn, 1997; Healy and Palepu, 2001).(Lennox and Park, 2006) believe that reduction in information asymmetry between managements and investors causes reduced opportunity for investment for using personal information to achieve more profit and thus it causes reduction in investment costs.

Considering that managers have more accurate information compared to outsiders of the company (Jensen and Meckling, 1976) they can reduce company's risk by accurate and reliable forecasts. Improved financial reporting and disclosures quality, lack of information asymmetry regarding company's performance reduces volatility of stock returns and risk (Rajgopal and Venkatachalam, 2011). One of the ways for reducing asymmetric information between managements and stakeholders is in the number of profit forecasts. That is, the higher is number of forecasts, information asymmetry is reduced. (Ajinkya and Gift, 1984) stated that managers through forecasts attempt to direct market expectations toward their own beliefs regarding future of business unit and considering signals which are provided by management forecasts, the stock market reviews its expectations and balance price of the company's stocks.

Dissemination of profit forecast by the managers leads to promotion of relationship between return and future profits. In their others, profit forecast by management help increasing information content of stock price about future profitability of the company. Dissemination of profit forecasts per share and its features influence the market ability to interpret forecast and reflection of forecast concept in the stock pricing. In addition, features of the forecast can show confidence of managers in their forecasts and helps investors for better understanding of relationship between forecasts and future profits and finally it allows stock pricing (Choi et al., 2011).





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Dissemination of financial forecasts helps adoption of investment decisions. Also, information related to profit and its forecast by manager is more considered by the investors and other stakeholders compared to other information disseminated by the company. As the manager as an informed person depicts future of the company through forecast of profit per share for stakeholders, information risk is decreased and investors act more secure in evaluation of future cash flows (Foster, 1979).

It is expected that companies whose policy is to disclose the predicted earnings have higher stock return and lower risk than other companies and it is due to more confidence of the capital market in these companies. Also, according to this expectation, it seems that volatilities or changes in profit forecasts affect return and risk of the company during fiscal year (Lopes, 2001).

Findings by (Zhang, 2012) showed that if there is high accuracy in previous forecasts, the forecasts provided for the new seasonal period (which is provided along with real performance of previous period) reduce reaction of stakeholders to real announced profits. (Graham et al., 2005) studied economic concepts of financial reporting of managers. They found that senior managers believe that accurate and reliable information disclosure can reduce information risk regarding stock. Thus, profit forecasts by the management can have tangible and long term effects on reduced risk of stocks of partners. Since logical investors seek for increasing their return at acceptable level of risk and investment in companies with higher value, they need criteria which can predict their investment performance (Hirst et al., 2008).

(Choi et al., 2008) evaluated effect of profit forecast dissemination by the manager on relationship between return and future profit. They studied effect of forecasts and their feature on response rate of future profits. They found that profit forecasts dissemination by the managers lead to increasing response rate of future profit. In other words, profit forecasts by managers is among important data for evaluation of future situation of the company and helps increasing information content of stock price about future profitability of the company, and the higher information are transferred by disclosures, it is allowed that returns reflect future profits better.

(Ng et al., 2006) in their work entitled Management Forecasts, Disclosure Quality, and Market Efficiency studied reaction of stock return following management forecasts and effect of disclosure quality on volume and magnitude of return. According to this research, abnormal stock return has a direct relationship with the management forecasts and the magnitude of abnormal return has a direct relationship with the reliability of management forecasts. Magnitude of abnormal return is greater for companies including very high positive news compared to companies with bad news.

(Gelb and Zarowin, 2002; Lundholm and Myers, 2002) found that overall disclosures help investors to predict future performance of the company better. Thus, when management disclose in higher quality, current returns reflect future profit better.

(Baginski and Hassel, 1997) studied relationship between management forecast precision and the size. They stated that large companies tend to access information in low costs. This information allows them to provide better forecasts. Thus, they believed there is direct relationship between size of company and management forecast precision.

(Ruland, 1978) compared forecasts of managers with forecast of analysts and time series models for years 1969 to 1973 and found that forecast of managers is more precise than forecast of analysts, but their difference is not significant. Also, forecast of analysts has lower precision if it is announced prior to forecast of managers compared to when it is announced after forecast of managers. Comparison of these two forecasts with time series models showed that forecast of analysts has no superiority over time series model if it is announced prior to forecasts of managers.





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### Research Hypothesis

Provision of profit forecasts by management of companies is one of the main information sources for users of financial information because of its information content, and it can affect market value of stock and its return. Return on equity is one of the criteria to measure the information content of company's forecasted profits. Thus, considering the above facts and theoretical foundations, in this study, the following hypotheses have been considered:

Hypothesis: the number of correct profit forecasts by manager effect on company's stock return

### RESEARCH METHODOLOGY

Current research is applied in terms of purpose and it is of descriptive – correlation type in terms of data collection method. Research statistical population includes Tehran Stock Exchange, stocks of which were transacted in Stock Exchange during 2009 to 2013. Sample companies were selected considering following limitations. Thus, systematic elimination sampling method was used.

They should have presence in stock exchange during 2009 - 2013.

They should not be among investment companies, insurance companies, banks and financial intermediaries.

Their fiscal year end should be March and they should not change their period in fiscal year.

In all years under study, needed information and financial data should be available at the end of fiscal year.

There should be no transaction stop for more than 3 months (due to use of quarterly profits and variable of stock return).

Their equity sum should not be negative.

Considering above conditions, 103 companies were selected as research sample.

### Research Variables and Their Measurement

#### Dependent Variable

It is variable that aim of author is its variability description or forecast. In other words, dependent variable is a major variable which is investigated as a critical issue for the research.

In this research, variable of stock return is dependent variable and it is obtained from following Relation:

$$RET = \frac{(P_t - P_{t-1}) + D_t + \frac{(P_t - P_{t-1}) \times N_c}{N_t} + \frac{N_e \times P_t}{N_t}}{P_{t-1}}$$

$P_t$  = price of stock at the end of fiscal year

$P_{t-1}$  = price of stock at the beginning of fiscal year

$P_n$  = nominal share value

$D_t$  = gross dividend per share

$N_e$  = the number of shares increased by reserves or retained earnings

$N_c$  = number of shares increased by cash

$N_t$  = Number of shares before the capital increase





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#### Independent Variable

It is the variable which influence positively or negatively. It is called the variable which is described or predicted through dependent variable. In this research, correct profit forecasts by managers is considered as independent variable.

MCP(Management correct prediction) =correct Profit Forecasts by management which equals to the number of correct profit forecast reports through comparison of real Profit of the end of period with forecast (first profit of period, three-month, six-month, nine-month) which has no adjustment over 20 percent (based on Stock Exchange rule, adjustments above 20 percent, whether positive or negative, is considered as important). Per correct forecasts there is score 1, otherwise it is 0, and sum of scores is from 0 – 4.

#### Control Variables

Following variables are considered as control variables.

Size = size of company (logarithm of total assets)

LEV = leverage ratio of company to total debts ratio divided by total assets

B/M = ratio of book value to market value of company

LOSS = it is an indicator variable which would be 1 if the company forecast loss, otherwise it is 0.

MAJ = ratio of stock owned by major stakeholders (above 5%) which own company's stock

#### Research Model

Following model is used for testing this hypothesis:

$$RET_{i,t} = \alpha_0 + \alpha_1MCP_{i,t} + \alpha_2SIZE_{i,t} + \alpha_3LEV_{i,t} + \alpha_4 B/M_{i,t} + \alpha_5LOSS_{i,t} + \alpha_6MAJ_{i,t} + \varepsilon_{i,t}$$

#### Research Findings

Given this table, since sig level of jarque - bera normality test has increased for all variables above 0.05. Thus,  $H_0$  is supported at confidence level and it suggests that research variables have normal distribution.

#### Results of Hypothesis Testing

Research hypothesis seeks for investigation effect of number of correct profit forecasts by managers on return on equity of company and statistical hypothesis is formulated as follows:

$H_0$  = the number of correct profit forecasts by manager has no effect on company's stock Return

$H_1$  = the number of correct profit forecasts by manager has effect on company's stock Return

In order to specifying panel data method efficiency, F-Limer test was used. In order to specify more suitable method (fixed effects and random effects method) for estimation, Haussmann test is used. The results of this test are given in Table 4.

Considering results of F-Limer test, since P-value for this test is below 0.05 (0.0000), consistency of intercepts is rejected and it is necessary to use panel data for model estimation.





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Also, considering results of Hausmann test, since P-value for this test is below 0.05 (0.0000), consistency of intercepts is rejected and it is necessary to use fixed effects method for model estimation. In investigation of consistency of residual variance, considering P-value related to White test is below 0.05 (0.00000), inconsistency of model residual variance is supported. In the research, instead of using ordinary least squares (OLS) method, Generalized Least Squares (GLS) method was used for eliminating this problem, and model coefficients were weighted using statistical software.

Considering Table 6, Durbin – Watson statistics is 1.871 which is between du and 4-du. Thus, it can be stated there is no autocorrelation between regression model errors and lack of autocorrelation between errors is accepted as one of the basic assumptions of regression. In investigation of the model significance, considering P-value of F statistics is smaller than 0.05 (0.0000), the significance of total model is supported with 95 percent of confidence. Coefficient of determination of the models denotes that 70.53 percent of changes in stock return are described by the variables included in the model.

Also, significance level (P-value) of t statistics related to variable of “number of correct profit forecast” is larger than 0.05 (0.9094), thus at 95 % confidence level it can be said that there is no significant effect of number of correct profit forecast by manager on company's stock return. Thus, research hypothesis is rejected at confidence level 95 percent.

## CONCLUSION AND RECOMMENDATIONS

In conclusion of research hypothesis testing results during time period 2009 – 2013, it can be stated there is no significant effect of number of correct profit forecast by manager on company's stock return.

Effect of company's size on return on equity is positive and significant. That is, larger companies are more profitable. Thus, they have higher return on equity. Results in relation with effect of financial leverage on company stock Return are negative and significant. That is, increase in debt of company's capital structures decreases company stock Return, which is consistent with findings by (Abdullah Al Qazi and Richard Fairchild, 2013; Acheampong et al., 2014). Losing comparing has reverse significant effect on variable of return on equity, i.e. the more is company losing, it causes reduction of stock return.

Considering findings in the current research, authorities and practitioner in investment in stock exchange can be recommended that they adopt such mechanism which they can rank companies in terms of number of correct profit forecast during the year and provide it to the public and stakeholders.

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**Table 1: Descriptive statistics of research variables**

| Variable                                   | symbol | Kurtosis | Skewness | Max    | Min     | SD     | Mean   | Observation |
|--|--------|----------|----------|--------|---------|--------|--------|-------------|
| Number of correct profit forecast          | MCP    | 1.468    | 0.116    | 4      | 0       | 1.580  | 1.944  | 500         |
| stock Return                               | RET    | 6.373    | 1.730    | 739.9  | -57.940 | 88.770 | 65.098 | 500         |
| Company Size                               | SIZE   | 4.524    | 0.931    | 18.817 | 10.816  | 1.386  | 13.750 | 500         |
| Leverage ratio                             | LEV    | 2.659    | -0.447   | 0.925  | 0.104   | 0.170  | 0.565  | 500         |
| Ratio of book value to market value        | B/M    | 5.127    | 1.420    | 2.540  | 0.026   | 0.409  | 0.645  | 500         |
| Lossing company                            | LOSS   | 24.355   | 4.832    | 1      | 0       | 0.191  | 0.038  | 500         |
| Ownership Percentage of major stakeholders | MAJ    | 5.192    | -1.455   | 98.010 | 0.000   | 18.934 | 71.326 | 500         |

**Table 2: Results of normality test for research variables**

| Variable   | Sig level | Jarque - Bera normality test |
|--|-----------|------------------------------|
| stock Return (RET)                               | 0.1749    | 3.486                        |
| Company Size (SIZE)                              | 0.2050    | 3.168                        |
| Leverage ratio (LEV)                             | 0.4774    | 1.478                        |
| Ratio of book value to market value (B/M)        | 0.6630    | 0.8217                       |
| Ownership Percentage of major stakeholders (MAJ) | 0.5748    | 1.107                        |





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**Table 3: Matrix of Pearson Correlation coefficients**

| Correlation |        |        |        |       |        |        |     |
|-------------|--------|--------|--------|-------|--------|--------|-----|
| Probability | MCP    | RET    | SIZE   | LEV   | B_M    | LOSS   | MAJ |
| MCP         | 1      |        |        |       |        |        |     |
| RET         | -0.055 | 1      |        |       |        |        |     |
|             | 0.212  |        |        |       |        |        |     |
| SIZE        | -0.019 | 0.046  | 1      |       |        |        |     |
|             | 0.670  | 0.296  |        |       |        |        |     |
| LEV         | 0.031  | -0.017 | 0.022  | 1     |        |        |     |
|             | 0.476  | 0.699  | 0.617  |       |        |        |     |
| B_M         | -0.064 | -0.359 | -0.017 | 0.067 | 1      |        |     |
|             | 0.149  | 0.000  | 0.692  | 0.131 |        |        |     |
| LOSS        | -0.191 | -0.094 | -0.125 | 0.120 | 0.149  | 1      |     |
|             | 0.000  | 0.0354 | 0.004  | 0.007 | 0.000  |        |     |
| MAJ         | 0.078  | -0.013 | 0.201  | 0.222 | -0.191 | -0.166 | 1   |
|             | 0.079  | 0.756  | 0.000  | 0.000 | 0.000  | 0.000  |     |

**Table 4: The results of model selection model for model estimation**

| Test type    | P-Value | Degree of freedom | Test statistics value | Test statistics |
|--------------|---------|-------------------|-----------------------|-----------------|
| F-Limer test | 0.0000  | (400, 102)        | 1.944                 | <i>F</i>        |
| Hausman test | 0.0000  | 6                 | 139.192               | $\chi^2$        |

**Table 5: White test results**

| Test type  | P-Value | Degree of freedom | Test statistics value | Test statistics |
|------------|---------|-------------------|-----------------------|-----------------|
| White test | 0.0000  | (482,26)          | 4.120                 | F               |





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**Table 6: Model estimation results**

| Variable                                   | VIF   | P-Value                 | T statistics | Coefficient |
|--|---|-------------------------|--------------|-------------|
| Constant                                   | -   | 0.0000                  | -6.536       | -718.996    |
| Number of correct profit forecasts         | 1.045   | 0.9094                  | -0.113       | -0.1457     |
| Company Size                               | 1.043   | 0.0000                  | 10.502       | 74.9270     |
| Leverage ratio                             | 1.119   | 0.0000                  | -5.435       | -160.3834   |
| Ratio of book value to market value        | 1.069   | 0.0000                  | -20.648      | -175.6128   |
| Losing company                             | 1.123   | 0.0501                  | -1.964       | -29.2124    |
| Ownership Percentage of major stakeholders | 1.172   | 0.1289                  | -1.512       | -0.4335     |
| F statistics<br>p-value                    | 8.864<br>0.0000                                 | Durbin – Watson statics |              | 1.871       |
| coefficient of determination<br>0.7053     | Adjusted coefficient of determination<br>0.6257 |                         |              |             |





RESEARCH ARTICLE

## Analyzing the Impact of Just-in-Time Method on Financial Performance of Listed Companies in Tehran Stock Exchange

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Received: 20 Mar 2015

Revised: 24 Apr 2015

Accepted: 30 May 2015

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### ABSTRACT

Operations management has experienced continuous innovations in manufacturing process management. Techniques such as lean manufacturing or just-in-time and total quality management have been included in these innovations. This study tries to find out whether return on assets and return on shareholders equity are appropriate criteria for determining the impact of distinct specific activities such as the implementation of just-in-time management on the economic performance or not. It also seeks to know whether an alternative criterion like the strength of profitability is a more appropriate base or not. To this end, the researcher uses data from 112 companies listed in Tehran Stock Exchange during the period 2009 to 2013, linear regression and panel data model. The results show that the optimal management of product inventory leads to an improvement in financial performance of the companies. It was expected that basic profitability management is a better criterion to assess the impact of inventory management on corporate financial performance, but this was not confirmed and the inventory management impact on the totality of financial performance measures was confirmed with the approval of the majority of hypotheses.

**Key words:** Operational innovation, Just-in-time method, Lean manufacturing, Financial performance.



**Peyman Gholizadeh and Reza Yousefi Hajibad****INTRODUCTION**

Operations management has experienced continuous innovations in manufacturing process management. Techniques such as lean manufacturing or just-in-time and total quality management have been included in these innovations. Just-in-time purchase means buying materials or goods in a way that they are delivered to the company exactly when they are needed in manufacturing or selling. Just-in-time production is a system according to demands and the producer manufacture the goods when they are needed production line. Total quality management is a process focusing on customers, it is quality-oriented based on facts led by senior managers to achieve the strategic goals of the organization through continuous improvement of processes. The establishment of an adequate return on investment in innovations is important for administrators wishing to implement operational innovations.

This article tries to analyze the potential relationship between implementation of just-in-time management and financial performance of the listed companies in Tehran Stock Exchange based on the existing literature and data relating to the companies. This article seeks (1) whether return on assets and return on shareholders equity are appropriate criteria for determining the impact of distinct specific activities such as the implementation of just-in-time management on the economic performance or not. Then, it investigates (2) whether an alternative criterion like the strength of profitability is a more appropriate base or not. The answer to these questions will be useful to recognize why a significant portion of the literature on the implementation of the just-in-time management, total quality management or environmental management systems and operational management methods leads to different results. Nowadays, economists say that profit is not the only motivation for the establishment of institutions, but they believe that the institutions may be established for welfare, social and economic purposes. Of course, besides some economists' theories, most businesses are established for profitability (Ghorbani, 2010, p. 22). Companies must prepare basic financial statements at the end of each period. One of these financial statements is the income statement and its last digit is the profits of the business. In fact, the benefit is one of the most notable factors in the measurement of unit economic activities (Saghafi & Aqae, 1994). It should be noted that the benefits provided by the management of companies at specified intervals is one important source of information for investors, creditors, and other users of company information in Stock Exchange (Heshi et al., 2009). Therefore, predicting corporate profitability has also a considerable importance. Since the available literature considers operational innovation including implementation of just-in-time management effective on financial performance and corporate profitability, this research can help to identify factors affecting the financial performance and profitability of the company and to estimate their future financial performance and profitability. Moreover, this article tries to determine which standard of just-in-time implementation can clarify the impact on the financial performance of a company.

**Theoretical Foundations**

**Just-in-time method** : Just-in-time is a subset of lean manufacturing principles that its main purpose is to eliminate waste through simplification and making efficient the manufacturing processes. The maintenance of a variety of raw materials and finished goods inventories have attracted much attention in various industries of developed countries in recent decades. Until recently, the necessity of an efficient management of inventories and the application of an appropriate inventory turnover had been considered to protect them against possible theft or losses. In this regard, just-in-time inventory management system was introduced; the system has been implemented in developed countries for many years and its benefits have been proved. Nonetheless, it is still not used in Iranian industry. Just-in-time inventory management system, along with the benefits for the organization, needs grounds, an environment and long-term planning to be performed properly (Khoddami Poor, 2009). After World War II, the Japanese people tried to rebuild their economies. This philosophy was developed for the first time by Taiichi Ohno at the Toyota factory in the 1950s and it aimed to meet customer demand with the least delay. Then, many Japanese companies implemented the system in the early 1970s. Hence, Taiichi Ohno is regarded as the father of just-in-time method (Moshabaki, 1996).



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**Lean manufacturing** :In principle, lean manufacturing is a combination of craft production and mass production so that it takes the flexibility of craft production and the low prices of goods produced in mass production. Generally, lean manufacturing is a manufacturing philosophy that reduces the gap between customers' order and sending products or products by removing all types of waste. Most organizations that have adopted lean manufacturing approach will recognize soon that their processes and methods of management and accounting are not synchronized with the new system.

**Financial performance** : The financial performance in the present study means the value creation of a company measured by factors such as the basic profitability, return on assets, return on equity, assets circulation, and profit margins. Industrial revolution and its continuation in Europe of the nineteenth century needed creation of large factories and implementation of large projects as the establishment of the national rail networks requiring such huge monetary investment that one or more investors, financial resources and even state were not able to afford it. Therefore, by taking advantage of the great achievements and benefits of the industrial revolution, the organization and collaboration, the first stock companies were formed so that the responsibility of shareholders is limited to the amount of their investment. Criteria such as economic value added, refined economic value added, market value added and economic residual income try in their evolutions to evaluate the performance of managers and adjustment of interest conflicts in addition to considering the of complexity managers' behavior; they also explain information on prices and stock returns.

## LITERATURE REVIEW

### Researches carried out in Iran

Izadi Nia and Taki (2010) investigate the impact of working capital management on the profitability of the companies listed in Tehran Stock Exchange. Their results showed that cash conversion cycle and return on assets has a significant negative correlation; moreover, high investment in inventory and receivable accounts leads to decline in profitability. The key factors in this study are product inventory period, receivable accounts period, payable account period, and cash conversion cycle.

Bahar Moghadam and Yazdi (2011) study the impact of working capital management on profitability of the companies listed in Tehran Stock Exchange. The results indicate that there is a significant positive correlation between operational efficiency of working capital management and profitability in the studied case. There is a significant and positive relationship between control variables (liquidity and size) and profitability.

Namazi et al (2012) concentrate on the relationships among changes in inventory, profitability and value of companies listed in Tehran Stock Exchange. The results of testing the first sub-hypothesis and the second hypothesis uncover the significant inverse relationship between changes in inventory and short-term changes in profitability and value of companies. In addition, the results of testing second and third hypotheses signify that there is no significant relationship between changes in inventory and long-term changes in profitability and changes in return on assets of the company. Moreover, the third and fourth hypothesis predicts no significant correlation between control variables and changes in inventory, profitability and firm value.

### Research conducted abroad

Rahman and Nasr (2007) investigate the impact of working capital management on profitability of 94 companies listed in the Stock Exchange of Pakistan during 1999-2004. They consider the effect of various factors of working capital manage including average collection period, inventory turnover period, average payment period, cash





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conversion cycle on net operating profit of the companies. They find a strong inverse relationship between rates of high working capital and profitability. In addition, administrators can create value for shareholders by reducing the cash conversion cycle to a desirable level. The results of similar studies on the relationship between working capital and profitability confirm this issue.

A research conducted by Samiloglu and Demirgunes (2008) about samples of Turkish manufacturing firms over the period 1998-2000 to investigate the relationship between profitability and working capital management showed that accounts receivable, inventory, and leverage periods have negative and significant impacts on profitability while the growth of the firm (in most sales) has positive and significant impact on profitability. However, the cash conversion cycle, firm size and fixed financial assets have not statistically an important impact on the profitability of firms. The results show that the profitability of the company increases by reducing the period of accounts receivable and inventory.

Studying the relationship between working capital management and profitability of American companies, Gill et al (2010) find that the shorter accounts receivable collection period relates to the higher profitability of the company. The result is consistent with theoretical predictions. They also found that the longer cash conversion cycle associates with higher profitability of the company.

Basu and Wang (2011) investigate the relationship between changes in the inventory, profits and firm value. Their results showed that a negative relationship exists between the inventory and firm performance. However, this relationship is weaker in wholesalers and retailers industry and the companies that normally hold down their inventory levels.

Klingenberg et al (2013) study the relationship between applying just-in-time method and corporate financial performance. They conclude that there is no consistent relationship between the return on assets, return on equity and basic profitability with the ratio of inventory management. They argue that return on asset, return on equity, and basic profitability, which reflects the results of all activities of the company, are not perfect for criteria determining the impact of just-in-time production on the company's financial performance.

Kroes and Manikas (2014) concentrate on the relationship between cash flow management and financial performance of American companies. Their results indicate that cash conversion cycle has no connection with the company's financial performance, but operating cash flow cycle has significant relationship to Tobin's Q ratio index. It should be noted that the decrease in accounts receivable and inventory were also significantly associated with the improvement of financial performance.

**Research Methodology and Data Collection Methods**

Library method will be used to gather the data needed to conduct this research. In this regard, theoretical principles of the research and literature will be induced by referring to books, articles and other available references. Moreover, data needed for testing the research hypotheses are extracted from the annual financial statements of companies, reports of the board of directors to the general assembly of shareholders, website of stock exchange organization, Rahavard Novin software and Tadbir Pardaz software.

**Statistical Population and Sample**

The statistical population includes companies listed in Tehran Stock Exchange during the year 2009 (2008) to the year 2013 (2012). It should be noted that the companies listed in Tehran Stock Exchange were selected because the institution presents the most available information on Iranian companies. The samples are selected through the





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systematic elimination of the target population; in this manner, 112 companies are selected as samples. Every company has five extractable sets of financial information from the financial statements and other related information resources for the years 2008 to 2012.

#### Models and Research Variables

Research models and variables are as follows (Klingenberg et al, 2013).

The below model is used to test the first, second, and third hypotheses:

$$BEP_{i,t} = \beta + IT_{i,t} + I/C_{i,t} + C-Q_{i,t} + \epsilon_{i,t}$$

Where,

**BEP:** Basic earning power that is equal to the ratio earning to total assets before deducting interest and taxes.

#### Independent variables

**IT:** Inventory turnover is the ratio of sales revenue to average inventory.

**I/C:** It is the ratio of inventory to current assets.

**C-Q:** It is difference between the current ratio (current assets to current liabilities) and quick ratio (Ratio of current assets minus inventory to current liabilities)

The below model is used to test the fourth, fifth, and sixth hypotheses:

$$ROA_{i,t} = \beta + IT_{i,t} + I/C_{i,t} + C-Q_{i,t} + \epsilon_{i,t}$$

Where dependent variable is:

**ROA:** Return on assets is the ratio of net income to total assets.

The below model is used to test the seventh, eighth, and ninth hypotheses:

$$ROE_{i,t} = \beta + IT_{i,t} + I/C_{i,t} + C-Q_{i,t} + \epsilon_{i,t}$$

Where dependent variable is:

**ROE:** Return on equity is the ratio of net income to equity.

#### Measurement Tools

The Eviews 7 is used to analyze the data. Moreover, Excel software is used to set up and carry out the sampling and sorting of data. Descriptive statistics and hypothesis testing results are stated in the following.

## RESEARCH FINDINGS

Research findings are mentioned below in two parts of descriptive statistics and inferential statistical.

#### Descriptive Statistics

Table 1 shows the results of mean, median (central values), standard deviation, maximum and minimum (dispersion measures) for the variables.

According to the results of Table (1), the ratio of inventory to current assets is 0.374 that is equal to the mean of values obtained from Iran Radiator Company in 2011 and North Cement Company in 2009. In addition, the highest ratio of inventory to current assets belongs to Weld and Oxygen Company in 2012; the lowest ratio belongs to Negin Coal Company in 2011.





**Peyman Gholizadeh and Reza Yousefi Hajibad****Inferential Statistics**

This study uses inferential statistics including Pearson correlation and multiple regression analysis to explore the relationship between independent and dependent variable. Furthermore, the default results of the regression analysis have been employed to ensure the reliability.

**Research hypotheses are as follows:**

1. Increase in inventory turnover has a positive effect on basic profitability.
2. Decline in the ratio of inventory to current assets increases basic earning power.
3. Decline in the difference of current ratio to quick ratio increases basic earning power.
4. Increase in inventory turnover has positive effect on return on assets.
5. The ratio of inventory to current assets has an inverse relationship with return on assets.
6. The difference between the current ratio and quick ratio is inversely correlated with return on assets.
7. Increase in current inventory has positive effect on return on shareholders' equity.
8. Ratio of inventory to current assets has a negative correlation with return on shareholders' equity.
9. The difference between the current ratio and quick ratio is inversely related to return on shareholders' equity.

**Multivariate Regression Analysis**

Before analyzing the research data, the reliability of the variables must be investigated. The reliability of the variables means that the mean and variance of variables over time and the covariance between the different variables between different years are fixed. Consequently, the use of these variables in the model does not lead to false regression. For this purpose, Levin, Lin and Chu test, Im, Pesaran and Shin (IPS) test, and Dickey-Fuller test are used. The results of Im, Pesaran and Shin (IPS) test are presented in Table (3).

According to Table (3), the significant level of research variables is less than 0.05, thus, all research variables in the study are reliable.

**Testing the Research Hypotheses****Testing the first model**

Chow test and Lymr F statistics are used to determine method for combined data and detection of homogenous or heterogeneous state. The test results are presented in Table (4).

According to Table (4), the results of Chow test indicate that panel data are used. The necessity of using fixed or random effects is checked by Hausman test in the following (Table 5).

According to Table (5), the significance level of Hausman test is less than 0.05, therefore, the fixed effects model should be used to estimate the model coefficients. The results of the test model using a fixed effects model are stated in Table (6).

According to the results presented in Table 6, since T-statistic for inventory turnover variable is higher than +1.965, there is a significant direct relationship between inventory turnover ratio and basic earning power; therefore, the first hypothesis is confirmed. However, T-statistic for inventory turnover to currents assets is higher than -1.965, hence, a significant inverse relationship exists between the ratio of inventory to current assets and basic earning power;



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therefore, the second hypothesis is confirmed. In addition, T-statistic for the difference between the current ratio and quick ratio is higher than -1.965, thus, a significant inverse relationship exists between the ratio the difference between the current ratio and quick ratio with basic earning power; therefore, the third hypothesis is confirmed.

**Testing the second model**

The second model is used to test fourth, fifth, and sixth hypotheses.

Chow test and Lymr F-statistics are used to determine method for combined data and detection of homogenous or heterogeneous state. The test results are presented in Table (10).

As seen in Table (10), the results of Chow test indicate that panel data are used. The necessity of using fixed or random effects is checked by Hausman test in the following (Table 11).

According to Table (5), the significance level of Hausman test is less than 0.05 (Table 11), therefore, the fixed effects model should be used to estimate the model coefficients. The results of the test model using a fixed effects model are stated in Table (12).

According to the results presented in Table 12, since T-statistic for inventory turnover variable is higher than +1.965, there is a significant direct relationship between inventory turnover and return on assets; therefore, the fourth hypothesis is confirmed. However, T-statistic for inventory to currents assets is higher than -1.965, hence, a significant inverse relationship exists between the ratio of inventory to current assets and return on assets; therefore, the fifth hypothesis is confirmed.

In addition, T-statistic for the difference between the current ratio and quick ratio is higher than -1.965, thus, a significant inverse relationship exists between the ratio the difference between the current ratio and quick ratio with return on assets; therefore, the sixth hypothesis is confirmed.

**Testing the third model**

The third model is used to test seventh, eighth, and ninth hypotheses. First, Chow test and Lymr F-statistics are used. The test results are presented in Table (13).

As seen in Table (13), the results of Chow test indicate that panel data are used. The results of Hausman test are in the following (Table 14).

According to Table (14), the fixed effects model should be used to estimate the model coefficients. The results of the test model using a fixed effects model are stated in Table (15).

According to the results presented in Table 15, since T-statistic for inventory turnover variable is higher than +1.965, there is a significant direct relationship between inventory turnover and return on shareholders' equity; therefore, the seventh hypothesis is confirmed. However, T-statistic for inventory to currents assets is higher than -1.965, hence, a significant inverse relationship exists between the ratio of inventory to current assets and return on shareholders' equity; therefore, the eighth hypothesis is confirmed. Moreover, T-statistic for the difference between the current ratio and quick ratio is higher than -1.965, thus, a significant inverse relationship exists between the ratio the difference between the current ratio and quick ratio with return on shareholders' equity; therefore, the ninth hypothesis is confirmed.



**Peyman Gholizadeh and Reza Yousefi Hajibad****CONCLUSION**

Overall, considering the totality of the results, it can be argued that the optimal management of inventory leads to improvement in the financial performance of companies. It was expected that basic profitability management is a better criterion to assess the impact of inventory management on corporate financial performance, but this was not confirmed and the inventory management impact on the totality of financial performance measures was confirmed with the approval of the majority of hypotheses. The reason for this is explained by Brox and Fader (2002) as they claim that waste of every activity is more than the absolute minimum that is required to complete the product or task in just-in-time method. Waste may include excess inventory movement, production interruptions, excess inventory, wastes and rework. According to Lai et al. (2004), the main meaning of just-in-time production is the presentation of needed goods at the right time and with acceptable quality. Just-in-time production system can be proposed as a philosophy seeking to integrate all aspects of the production process including the entrance of materials to production and delivery of materials. The method can improve efficiency through reduction of wastes and increase the value added to the product.

**Recommendations Arising from the Research Findings**

The findings suggest that implementation of just-in-time method has significant effect on the financial performance of companies. Therefore, the most important recommendations focus on this issue.

1. It is suggested for managers and decision makers in companies listed in Tehran Stock Exchange to pay enough attention to implementation of just-in-time method and reduction of product inventory level when they are going to decide about inventory management.
2. It is suggested for companies listed in Tehran Stock Exchange to pay enough attention to the status of the company in terms of inventory management, which can have several effects on the value of the company's financial performance, when they are going to invest on a project or trade shares.
3. It is suggested for the Securities and Exchange Organization and active associations in the field of management accounting to inform managers of the companies listed in Tehran Stock Exchange of the importance and the approaches of implementing just-in-time strategy by holding training courses or other means of notification.

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**Table 1. Descriptive characteristics of the studied variables**

| Research variables | Number | Mean  | Median | Standard deviation | Maximum | Minimum |
|--------------------|--------|-------|--------|--------------------|---------|---------|
| <b>IT</b>          | 544    | 4.054 | 3.569  | 2.092              | 11.817  | 0.744   |
| <b>I/C</b>         | 560    | 0.386 | 0.374  | 0.16               | 0.872   | 0.046   |
| <b>C-Q</b>         | 558    | 0.494 | 0.436  | 0.295              | 1.647   | 0.047   |
| <b>BEP</b>         | 560    | 0.126 | 0.108  | 0.132              | 0.563   | -0.291  |
| <b>ROA</b>         | 559    | 0.108 | 0.093  | 0.114              | 0.482   | -0.288  |
| <b>ROE</b>         | 556    | 0.257 | 0.227  | 0.299              | 1.327   | -1.32   |
| <b>AT</b>          | 559    | 0.805 | 0.742  | 0.378              | 2.528   | 0.119   |
| <b>PM</b>          | 560    | 0.148 | 0.12   | 0.187              | 0.768   | -0.636  |

**Table 2. Correlation between dependent and independent variables**

|            | BEP    | ROA     | ROE    | AT     | PM      | IT | I/C     | C-Q     |
|------------|--------|---------|--------|--------|---------|----|---------|---------|
| <b>IT</b>  | 0.01*  | 0.103   | 0.081  | 0.395  | 0.034   | 1  | 0.486** | -0.41** |
| <b>I/C</b> | -0.05  | 0.063   | -0.021 | 0.043  | -0.074  |    | 1       | 0.606** |
| <b>C-Q</b> | 0.33** | 0.321** | 0.086* | 0.091* | 0.205** |    |         | 1       |

\* = Significant at the 95% confidence level; \*\* Significant at the 99% confidence level





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**Table 3. Im, Pesaran and Shin (IPS) test**

| Research variables | T-statistics | Prob. |
|--------------------|--------------|-------|
| IT                 | -10.139      | 0.000 |
| I/C                | -11.002      | 0.000 |
| C-Q                | -10.892      | 0.000 |
| BEP                | -11.101      | 0.000 |
| ROA                | -11.275      | 0.000 |
| ROE                | -11.542      | 0.000 |
| AT                 | -10.776      | 0.000 |
| PM                 | -9.46        | 0.000 |

**Table 4. The results of Chow test for detection of homogenous or heterogeneous state**

| Null hypothesis                      | F-statistic | Prob. | Chow test result             |
|--------------------------------------|-------------|-------|------------------------------|
| Temporal effects are not significant | 12.525      | 0.000 | Null hypothesis is rejected. |

**Table 5. The results of Hausman test**

| Null hypothesis              | F-statistic | Prob. | Chow test result             |
|------------------------------|-------------|-------|------------------------------|
| Using a random effects model | 6.2         | 0.01  | Null hypothesis is rejected. |

**Table (6). First model test results**

| Variables                   | Coefficients | Standard Deviation                    | T-statistics | Prob. |
|-----------------------------|--------------|---------------------------------------|--------------|-------|
| Constant                    | -0.01        | 0.02                                  | -0.64        | 0.51  |
| IT                          | 0.02         | 0.002                                 | 8.03         | 0.000 |
| I/C                         | -0.15        | 0.041                                 | -3.73        | 0.000 |
| C-Q                         | -0.22        | 0.01                                  | -11.45       | 0.000 |
| F-statistics                | 20.74        | The coefficient of determination      |              | 0.84  |
|                             |              | Adjusted coefficient of determination |              | 0.80  |
| Probability of F-statistics | 0.000        | Durbin Watson Statistic               |              | 2.06  |





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**Table 10. The results of Chow test**

| Null hypothesis                      | F-statistic | Prob. | Chow test result             |
|--------------------------------------|-------------|-------|------------------------------|
| Temporal effects are not significant | 11.282      | 0.000 | Null hypothesis is rejected. |

**Table 11. The results of Hausman test**

| Null hypothesis              | Chi-square test | Prob. | Chow test result             |
|------------------------------|-----------------|-------|------------------------------|
| Using a random effects model | 7.46            | 0.02  | Null hypothesis is rejected. |

**Table (12). Second model test results**

| Variables                   | Coefficients | Standard Deviation                    | T-statistics | Prob. |
|-----------------------------|--------------|---------------------------------------|--------------|-------|
| Constant                    | -0.01        | 0.01                                  | -0.64        | 0.52  |
| IT                          | 0.01         | 0.002                                 | 7.67         | 0.000 |
| I/C                         | -0.14        | 0.03                                  | -3.9         | 0.000 |
| C-Q                         | -0.2         | 0.01                                  | -11.6        | 0.000 |
| F-statistics                | 18.8         | The coefficient of determination      |              | 0.83  |
|                             |              | Adjusted coefficient of determination |              | 0.79  |
| Probability of F-statistics | 0.000        | Durbin Watson Statistic               |              | 1.91  |

**Table 13. The results of Chow test**

| Null hypothesis                      | F-statistic | Prob. | Chow test result             |
|--------------------------------------|-------------|-------|------------------------------|
| Temporal effects are not significant | 3.067       | 0.000 | Null hypothesis is rejected. |

**Table 14. The results of Hausman test**

| Null hypothesis              | Chi-square test | Prob. | Chow test result             |
|------------------------------|-----------------|-------|------------------------------|
| Using a random effects model | 5.52            | 0.062 | Null hypothesis is rejected. |





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**Table (15). Third model test results**

| <b>Variables</b>                   | <b>Coefficients</b> | <b>Standard Deviation</b>             | <b>T-statistics</b> | <b>Prob.</b> |
|------------------------------------|---------------------|---------------------------------------|---------------------|--------------|
| <b>Constant</b>                    | -0.08               | 0.11                                  | 0.558               | 0.405        |
| <b>IT</b>                          | 0.04                | 0.01                                  | 3.37                | 0.000        |
| <b>I/C</b>                         | -0.02               | 0.001                                 | -16.6               | 0.000        |
| <b>C-Q</b>                         | -0.1                | 0.04                                  | -2.1                | 0.02         |
| <b>F-statistics</b>                | 3.39                | The coefficient of determination      |                     | 0.47         |
|                                    |                     | Adjusted coefficient of determination |                     | 0.33         |
| <b>Probability of F-statistics</b> | 0.000               | Durbin Watson Statistic               |                     | 2.04         |





## Strategy Formulation by FMEA Method: Case Study of Shayan Sanat Company

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Received: 29 Mar 2015

Revised: 25 Apr 2015

Accepted: 27 May 2015

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### ABSTRACT

The changing world in current era obliged the organizations to be changed for survival and apply the opportunities and eliminate the threats or minimize their effects. Avoiding the failure of strategies is one of the main concerns of top managers in organizations. This study applied Failure mode and effects analysis (FMEA) as a good method to determine, classify and analyze the failures models with preventive approach instead of reactive action in strategy formulation as a new method. By good scoring of severity, occurrence and detection of each of potential failures models and calculation of Risk Prioritization number (RPN) to determine the highest failures models in clutch Manufacture Company of ShayanSanat attempted to improve its current position to achieve the position based on existing opportunities and threats in business space.

**Key words:** Strategy, Strategy formulation, Strengths, Weaknesses, FMEA, FMEA concepts

### INTRODUCTION

Strategy formulation for industrial, commercial and service companies in Iran namely at present with global economy is of great importance. The necessity of formulation of strategy is felt when we know in our country, most companies and organizations don't have strategy or consideration is not made in formulation, execution and its review. Entrepreneurship of owners in private sectors and emphasis on personal experiences in coping up with problems or organizational activities have caused that most of them are passive in coping up with the changes in business and this measurement is not compensated in most cases. Strategy failure in formulation and its execution is one of the important issues in strategy management. Failure mode effective and analysis (FMEA) is a necessary technique as applied widely in engineering projects to predict failure modes and reduction or elimination of potential







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failure modes at design and execution. No study is regarding this method in SWOT matrix to determine failure models and suitable preventive actions to reduce failures models. The present study aimed to achieve a strategy or an optimal strategy for Clutch manufacturing company of ShayanSanat by this method. To achieve this goal, we achieve minor goals of this study:

The identification of weaknesses and strengths and periodization of using or coping up with them  
 Identification of opportunities and threats and their prioritization to use the opportunities and coping up with threats and familiarity of managers of organization with FMEA concepts and its application  
 Introduction of managers with planning and strategic thought  
 Finding the strategy or strategies consistent with business of ShayanSanat clutch manufacturing  
 Doing various stages of strategy formulation in the organization with the participation of managers and theorists

#### Theoretical basics and review of literature

The strategic management of formulation, execution and evaluation of decisions is a multiple duty enabling the organization to achieve the goals (David, 2003, 24). Strategic management consists of three sectors of formulation, execution and evaluation of strategy (Arabi, 2008, 5). Strategies analysis methods include matrix of external factors evaluation (opportunities and threats) and internal factors matrix (strengths and weaknesses) (Ali Ahmadi, 2003, 183). FMEA is a systematic method to analyze and rank risks and different modes of failure. By investigation and ranking those for highest priorities can be defined. FMEA is a tool to identify failure models before their occurrence and to reduce risk. This law-based technical method "prevention before occurrence" is used for potential failure factors. The aim of FMEA is searching all items leading to failure of product or process before the product is produced or process is produced.

#### FMEA definitions

**Severity** It is the rank showing the amount of potential failure mode.

**Occurrence** It is the failure occurrence as classified based on it.

**Detection** The current controls of a system can detect a failure mode or failure reason

Risk Priority Number: RPN is the multiplication of severity, occurrence and detection values (QolamrezaDabiri, 2002, 44). By calculation of RPN ( $RPN = S \cdot O \cdot D$  Ȳ  $RPN = S \cdot O$ ) and focusing on above values, instead of considering all items, we can avoid failure.

#### FMEA follows three goals

Avoiding failure occurrence

Creating and developing a product, process or new service

Registering parameters and indices in design and development, process or service (Stamatis, 1995).

#### Research method

This study is applied in terms of purpose and descriptive-analytic in terms of data collection and descriptive-analytic and field study in terms of paradigm in positivism paradigm. BY questionnaire and interview with managers, experts and customers, the data is collected. Library data is used. The study population is all owners and top



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managers and experts of company as 12 people. The committee of strategy formulation is experts with required information of this industry as 5 people. Based on limited study population, there is no sampling. This study is conducted in current year in clutch manufacturing of ShayanSaanaatCompany for suitable strategy formulation. It is expected the results are used in this organization. To fulfill validity of questionnaire, the designed questions are based on standard questionnaires, theses, books and papers and finally, they are shown to experienced experts as managers and supervisors are asked for questionnaire. The reliability of this study is calculated by Cronbach's alpha and it is used to compute the internal consistency of measures as questionnaire or tests measuring various features.

**First phase Education and norms making**

The concerns of the outcomes of changes can make some residence in the people who know the changes consciously or unconsciously for their loss. At least 3 educational sessions are held for each of specialized fields in organization to help the perception, transfer of strategy concepts for each of engineering, production, quality, systems, sale and business, purchase, maintenance, financial, production planning as increasing the interest of people to participate in strategy formulation of organization. After holding these educational sessions, FMEA is held for 5 sessions and publicly.

**Second phase Strategy formulation****First stage Formulation of mission and statement of mission of organization and perspective**

By participation of committee of strategy formulation and some sessions, draft is prepared and is presented to be approved to board. Board by some changes in activity, approved mission and organizational perspective as followings:

Production of different discs and clutch and car body parts based on global standards with the aim of fulfilling the satisfaction of customers as the first selection of customers in terms of cost, quality. Respecting the internal and external beneficiaries and fulfill their satisfaction are always considered by organization.

Second stage: Determining organizational values: After holding 2 sessions in strategy formulation and approving board of organizational values, ShayanSanat clutch manufacturing company is approved as:

We believe in clutch manufacturing ShayanSanatCompany as:

The main secret of durability of organization is the customers of organization. We view our customers as a partner fulfilling their needs is our duty.

Specialization and commitment of co-workers guarantees qualitative and quantitative development of our products.

Improving scientific level of co-workers and considering research and development in business.

Continuous improvement of current business and it is considered as one of the fundamental principles in all activities and processes of organization.

Achieving production with zero waste as foundation of qualitative infrastructure of products.

**Third stage Environmental factors evaluation**

By holding session in committee of strategy formulation and brain storming in the first session and coefficients of each of factors by each of members, after two sessions of discussion about internal and external factors, finally, the followings are selected as the most important one and FMEA is formed.





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**External factors evaluation**

Opportunities

The scientific centers and increasing the mean of education

Spare parts production

Production under license

Economic conditions of foreign countries and emergence of new economic powers

Threats

Inflation rate

Economic sanction

Instability in tax rules and increasing tax pressures (internal organizational report source, report of goods cost as 2009/6/31).

Lack of timely payment of claims by automotive companies

Instability of import condition of country

**Internal factors evaluation**

Strengths

Quality management system

Performance test lab and disc life service and manufacturing discs

Establishment of test devices in some central agencies of automotive companies in the country

Free capacity of source production: Internal organizational reports

Relationship with qualitative authorities of automotive companies

Weaknesses

Liquidity problem

Lack of marketing unit and specialized sale

Lack of using production free capacity

NO consideration of human resources

Problem of providing raw materials and services in the country

Single source suppliers

**Fourth stage Determining the macro goals of organization**

By considering the opportunities and threats, weaknesses and strengths and after holding two sessions about macro goals of organization, the followings are considered as macro goals of clutch manufacturing company of ShayanSanat based on internal and external environmental conditions:

Activity in spare parts market and achieving minimum share 40% to three next years.

Using free capacity of production

increasing productivity

Reduction of products cost

**Fifth stage Determining required indices to measure macro goals of organization:** By holding session in committee of strategy formulation about measurement and indices to measure macro goals of organization, discussion is made. By conclusion of opinions and measurement for some months, Table 1 was approved by members of committee of strategy formulation:





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#### Determining the relevant tables of FMEA

By FMEA concepts and after holding educational sessions, after some changes, the severity and occurrence values are used as basis of calculation.

**Completion of FMEA Tables (internal and external factors)** By holding sessions of external and internal factors in strategy formulation committee, required values for Tables are extracted and RPNs are computed.

Table 4 shows FMEA of investigation of opportunities as sample. These calculations are done for threats, strengths and weaknesses.

#### Providing external factors evaluation matrix

The calculation of significance coefficient based on RPNs of FMEA is as at first cumulative sum of RPNs is obtained to compute the share of each of items (opportunities and threats) of one. To do this, RPNs of each item are divided by cumulative sum of RPNs. The value indicates its relative importance coefficient of the item.

After determining the normal opportunities and threats ranks 3, 4 are given to opportunities and rank 2 or one for threats. If the opportunity of an organization is a unique opportunity, it is rank 4 and if it is an ordinary opportunity, rank 3. If the threat of organization is serious, rank 1 and if the threat is normal, rank 2 is dedicated. In allocation of rank to these factors, members of strategy formulation committee opinion is used. If there was no agreement regarding rank of threat or opportunity, frequency of ranks is considered as final rank. To compute weighted score, relative importance coefficient is multiplied by dedicated rank. Table 3 shows the External Factor evaluation matrix (EFE). By applying the coefficient of RPNs computation and dedication of weight coefficient, the score for each of opportunities and threats is shown in the column. The sum of column of weighted score is 3.33. This value is used in determination of organization strategies in IE matrix.

#### Providing internal factors evaluation matrix

To calculate importance coefficient based on RPNs of FMEA, at first cumulative sum of RPNs is obtained to compute the share of each of items (strengths and weaknesses) of 1. To do this, we divide RPNs of each item by cumulative sum of RPNs. The value indicates relative importance coefficient of the item.

#### The rank of each item is achieved as followings

After determining the key or normal weakness or strengths, ranks 3,4 are given to strengths and rank 2 or 1 to weakness. If the strength of organization is an excellent strength, rank 4 and if it is an ordinary strength, rank 3 is dedicated. If the organization weakness is a critical weakness, rank 1 and if it is an ordinary weakness, rank 2 is dedicated. In allocation of rank to these factors, the opinion of members of strategy formulation committee is used. If there is no agreement regarding the strengths and weaknesses, high frequency about giving ranks is considered as final rank. To compute the weighted score, we multiply relative importance coefficient on the dedicated rank. Table 4 shows the full matrix of internal factor evaluation (IFE).

#### Providing internal and external matrix (IE)

In internal factors evaluation, after computation of sum of weighted score, if the value is more than 2.5, it means that the strengths of organization are more than its weaknesses and can cover the weakness, otherwise covering the





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weakness of organization is difficult. In external factors evaluation, after calculation of the sum of weighted score, if the value is more than 2.5, it shows that the opportunities are as they can overcome environmental threats.

In calculation of weighted score of internal and external factors, the following values are achieved:

The result of internal factors evaluation: 1.79 and the result of external factors evaluation: 3.33

By plotting table IE, we can say Clutch Manufacture Company of ShayanSanat works in the activity taking conservative strategies.

Chart 1- Internal and external matrix

The final score of internal factors evaluation

**Sixth stage Decision making stage:** By FMEA on all proposed strategies based on effect on macro organizational goals, prioritized strategies are determined as followings:

One of the problems of zoning in SWOT matrix is that basis of strategy selection is only based on region and opportunities of using other strategies is eliminated. By putting FMEA results beside each other and elimination of similar results, strategies priority is determined as:

By holding session in committee of strategy formulation and results of study in this session, acceptable strategies were selected at macro level based on the opinion of managing director and middle managers of six first strategies in terms of priority. By comparison of this Table and calculation in IE matrix to select strategy in conservative region, two strategies are added.

**Seventh stage :** The mission of units inside the organization: After strategy formulation at macro level of organization, by proposition of members of strategy formulation committee, mission is determined for each of organization units. The draft of mission of units (management, engineering, sale and marketing, planning and supply, maintenance, technical and other units) are prepared by managers of units and collaboration of required staffs in the relevant unit.

Determining duty strategies: As in clutch manufacturing ShayanSanatCompany, the following processes are selected as the main processes and duty strategies are defined based on each process. Existing processes in organization: 1- Production and quality, 2-Financial, 3-Technical and engineering, 4-Providing and support, 5- Sale and planning, 6- Training and human resources.

Production and quality strategies

Timely production based on customer (presented by planning unit)

Full control of important parameters of final product

Collaboration with training unit and human resources to execute presented plans from the unit

Using pure production concepts for training, execution and its implementation

Elimination of re-working by production of product based on customer need and technical features

Implementation of requirements of foreign companies in production line and control of manufacturing processes

Providing reports of raw materials consumption and control of deviation of their consumption

Financial strategies

Required funding for activity in spare parts market





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Collaboration with education unit and human resources to execute the presented plans from the unit  
Providing the reports of cost as regular with definite time table  
Providing required funding for collaboration with foreign company to get license  
Providing reports of fixed and varied costs as regular with definite time table.  
Technical and engineering strategies  
Comparison of competitors products with the products of organization qualitatively  
Collaboration with foreign company to achieve update technical knowledge and using it in organization  
Collaboration with education and human resources unit to perform the plans presented by the unit  
Follow up and finalizing new projects in determined executive unit  
Improvement of manufacturing process with review in all production processes  
Creating improvement projects for manufacturing processes as with high problems compared to the others.  
Support strategies  
Planning raw materials based on planning unit and its statement as well to suppliers  
Collaboration with education and human resources unit to implement plans from the u nit  
Finding domestic suppliers in raw materials with quality and less cost.  
Improving suppliers as qualitatively and their timely delivery  
Finding new suppliers for raw materials or services as single source now.  
Sale and planning strategies  
Finding and conclusion of contract with major sellers and big repair shops  
Measuring, analysis of competitors continuously and formulation of good sale plan  
Conclusion of new contracts to produce new products of disk  
Collaboration with education and human resources unit to execute presented plans from the unit  
Establishing good communication with OEM authorities to increase sale share of organization  
Presenting the daily production plan to control free capacity  
Reduction of logistic costs  
Education and human resources strategies  
Norms making of focusing on needs of customer  
Employment of specialized people in marketing and sale  
Employment of specialist or consulting from valid organizations to improve current condition and formulation of human resources strategy  
Determining required training to increase awareness of staffs of organization  
Continuous educational plan in transferring new concepts in quality and production  
Formulation of required educational plans to achieve new conditions based on new needs of organization  
Measuring the effectiveness of educational periods with pre-defined goals

**DISCUSSION AND CONCLUSION**

Based on this study aim, strategy formulation for clutch manufacturing company of ShayanSanat and determining the opportunities, threats, strengths and weaknesses by FMEA, the present study attempted to use planning principles and strategic management, a good strategy of current business of clutch manufacturing of ShayanSanat company at macro and duty levels. Strategic planning has not good result without collaboration of beneficiaries or acceptance by them. Supporting the beneficiary groups in strategy formulation is one of the great concerns in this study. Using FMEA in product production is applied in the companies and manufacturing organizations. In this study, it is assumed that macro organizational goals are used as main goal of FMEA. The relevant items of identification (opportunities, threats, strengths and weaknesses) based on priority are used.

The tables of severity rank and effect in strategy formulation are determined.



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The relative importance coefficient of each of factors to RPN value is obtained by sum of RPN. One of the success factors of FMEA is its implementation. The aim of FMEA is searching all items leading to failure of a product or process.

The macro organizational goals are considered as input of FMEA. By calculation of RPNs for each of factors in achieving macro goals, relative importance coefficient of each of items in SWOT matrix is extracted and then the calculations are done.

As the input of FMEA Tables, macro goals are considered. By determining severity of effect of each of environmental factors (internal and external) in achieving macro goals of organization, without considering the condition of organization as recognized as severity, current condition of organization for the factor is ranked in terms of effect or using it in achieving the goal.

This study combined FMEA method in strategy formulation process with positive results and both concepts of strategy management and FMEA are considered as a part of organizational learning to organization storage.

The recommendations presented to organization

Implementation of system requirements of ISMS: Based on activity ground of organization and as there is technical knowledge of design of disc and plane in clutch manufacturing company of ShayanSanat, maintaining the technical information and control of technical information namely by engineering unit of organization is of great importance.

Regular holding of review sessions in organizational strategies in definite time periods based on current conditions of organization and environment holding evaluation sessions of organizational performance in the form of regular and monthly sessions

Evaluation of strategy execution with periodical audit of quality management system as performed each 6 months in organization.

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**Table 1- Indices and period of measurement of macro goals of organization**

| Measurement method   | Period   | Goal   |
|--|----------|--|
| The ratio of organization selling to 2.5 million (number of cars using the products of this company) | 6 months | Activity in spare parts market and achieving the share of at least 40% to 3 next years |
| The ratio of nominal capacity of machineries to production machineries production                    | 3 months | Using free capacity of production  |
| Ratio of production numbers to per hours of staffs presence  | 3 months | Productivity increase  |
| Calculation of cost by standard accounting method  | Monthly  | Reduction of products cost   |

**Table 2- The ranking of severity in strategy formulation (S)**

| Severity       | Rank | Criterion   |
|----------------|------|---|
| Nothing        | 1    | It has no effect on macro organizational goals.                       |
| Very low       | 2    | It has mild effect on macro organizational goals.                     |
| Relatively low | 3    | It has little effect on macro organizational goals.                   |
| Low            | 4    | It has relatively little effect on macro organizational goals..       |
| Average        | 5    | It has average effect on macro organizational goals.                  |
| Important      | 6    | It has relatively high effect on macro organizational goals.          |
| High           | 7    | It has high effect on macro organizational goals.                     |
| Very high      | 8    | It has high and relatively high effect on macro organizational goals. |
| Serious        | 9    | It has considerable effect on macro organizational goals.             |
| Risky          | 10   | It has highly effect on macro organizational goals.                   |







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**Table 3-Ranking probability of occurrence in strategy formulation (O)**

| Occurrence or usefulness | Rank | Criterion  |
|--------------------------|------|--|
| Almost impossible        | 1    | There are very high experiences in using or coping up with it in organization.               |
| Rarely                   | 2    | There are high experiences in using or coping up with it in organization.                    |
| Very low                 | 3    | There are relatively high experiences in using or coping up with it in organization.         |
| Low                      | 4    | There are average high experiences in using or coping up with it in organization.            |
| Relatively low           | 5    | There are relatively low experiences in using or coping up with it in organization.          |
| Average                  | 6    | There is little experience in using or coping up with it in organization.                    |
| Average to high          | 7    | There are very few experiences in using or coping up with it in organization.                |
| Much                     | 8    | There are very few experiences in using or coping up with it in organization.                |
| Very much                | 9    | There are no experiences in using or coping up with it in organization.                      |
| Almost definite          | 10   | There is no empirical or executive experience of using or coping up with it in organization. |

**Table 4- FMEA of opportunities investigation**

| Analysis of failure modes in strategy formulation  |     |   |   |   |   |   |
|--|-----|---|---|---|---|---|
| Aim-Subject: Evaluation of effective environmental opportunities on organizational mission and perspective |     |   |   |   |   |   |
| Proposed measurements  | RPN | O | S | Potential failure effects   | Potential failure effects                           | Potential failure modes                                     |
| Considering RPNs in determining coefficients in EF Table   | 3   | 5 | 7 | Lack of using scientific centers and increasing the mean of education | The effect on achieving perspective and macro goals | Lack of access to perspective and main goal of shareholders |
|  | 5   |   |   | Lack of entering to spare parts market                                |   |   |
|  | 9   | 1 | 9 |   |   |   |
|  | 0   | 0 |   |   |   |   |
|  | 5   | 9 | 6 | Lack of production under license                                      |   |   |
|  | 4   |   |   |   |   |   |





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**Table 5-External factors evaluation matrix**

| Weighted score | Weight | Coefficient coefficient | External factors  |               |
|----------------|--------|-------------------------|---|---------------|
| 0.27           | 3      | 0.09                    | Using scientific centers and increasing mean of education | Opportunities |
| 0.88           | 4      | 0.22                    | Spare parts market  |               |
| 0.52.          | 4      | 0.13                    | Production under license                                  |               |
| 0.18           | 3      | 0.06                    | Increasing inflation rate                                 | Threats       |
| 0.48           | 4      | 0.12                    | Economic embargo  |               |
| 0.18           | 3      | 0.06                    | Instability in tax law and increasing tax pressures       |               |
| 0.64           | 4      | 0.16                    | Lack of timely payment of claims by automotive companies  |               |
| 0.18           | 3      | 0.16                    | Instability of import condition in the country            |               |
| 3.33           |        | 1                       | Sum   |               |

**Table 6- Internal factors evaluation matrix**

| Weighted score | Weight coefficient | Coefficient | Internal factors  |           |
|----------------|--------------------|-------------|---|-----------|
| 0.28           | 4                  | 0.07        | Presence of quality management system   | Strengths |
| 0.16           | 4                  | 0.04        | Performance test lab and life of disc and organization produced discs                                   |           |
| 0.15           | 3                  | 0.05        | Establishment of test devices in some important central agencies of automotive companies in the country |           |
| 0.12           | 3                  | 0.04        | Free capacity of production   |           |
| 0.15           | 3                  | 0.05        | Relationship with qualitative authorities of automotive companies                                       |           |





|      |   |      |  |                   |
|------|---|------|--|-------------------|
| 0.13 | 1 | 0.13 | Liquidity problem  | <b>Weaknesses</b> |
| 0.17 | 1 | 0.17 | Lack of marketing unit and specialized sale                    |                   |
| 0.18 | 1 | 0.18 | Lack of activity in spare parts market                         |                   |
| 0.18 | 2 | 0.09 | Lack of using free production capacity                         |                   |
| 0.12 | 2 | 0.06 | Lack of considering human resources                            |                   |
| 0.14 | 2 | 0.07 | Problem in providing raw materials and services in the country |                   |
| 0.1  | 2 | 0.05 | Single source of suppliers                                     |                   |
| 1.79 |   | 1    | Sum  |                   |

**Table 5- FMEA of evaluation of the effect of strategies on macro goals**

| Analysis of failure modes in strategy formulation  |     |   |   |   |                               |                                       |
|--|-----|---|---|---|-------------------------------|---------------------------------------|
| Aim/Subject: Activity in spare parts market and achieving the share of at least 40% to 3 next years. |     |   |   |   |                               |                                       |
| proposed actions   | RPN | O | S | Potential reasons of failure  | Potential failure effects     | Potential failure modes               |
| Determining prioritized strategies to execute based on RPN score                                     | 24  | 4 | 6 | Lack of using free capacity of production for activity in spare parts market.                           | Lack of achieving macro goals | Lack of success in spare parts market |
|  | 32  | 8 | 4 | Lack of Increase of production share in market OEM by licensed production of a valid foreign company.   |                               |                                       |
|  | 18  | 6 | 3 | Lack of Employment or consulting of authorities to increase productivity of production to reduce costs. |                               |                                       |
|  | 20  | 5 | 4 | Lack of Increasing productivity and improvement in manufacturing processes                              |                               |                                       |
|  | 40  | 8 | 5 | Lack of Using free capacity of production to increase revenue of products sale increase                 |                               |                                       |





|  |    |   |   |   |  |  |
|--|----|---|---|---|--|--|
|  |    |   |   |   |  |  |
|  | 24 | 4 | 6 | Lack of Increasing productivity in manufacturing processes and reduction of products costs                  |  |  |
|  | 24 | 8 | 3 | Lack of using specialized people in human resources to improve motivation and job satisfaction of personnel |  |  |
|  | 72 | 8 | 9 | Lack of serious presence in spare parts market  |  |  |
|  | 20 | 5 | 4 | Lack of taking sale agency of similar foreign products in current industry                                  |  |  |
|  | 20 | 4 | 5 | Lack of Reduction of fixed and varied organizational costs  |  |  |
|  | 15 | 3 | 5 | Lack of Tear one projects   |  |  |

**Table 6- FMEA of weaknesses**

| Analysis of failure modes in strategy formulation          |     |   |   |  |                               |  |
|--|-----|---|---|--|-------------------------------|--|
| Aim/Subject: Using production free capacity                |     |   |   |  |                               |  |
| Proposed actions   | RPN | O | S | Failure potential reasons  | Potential failure effects     | Potential failure modes                |
| Determining prioritized strategies to execute in RPN score | 12  | 6 | 2 | Lack of Employment or consulting of authorities to increase productivity of production to reduce costs | Lack of achieving macro goals | Lack of using free production capacity |
|  | 24  | 8 | 3 | Lack of Increase of production share in market OEM by licensed production of a valid foreign company.  |                               |  |
|  | 15  | 5 | 3 | Lack of Increasing productivity and improvement in manufacturing processes                             |                               |  |





|  |    |   |   |   |  |  |
|--|----|---|---|---|--|--|
|  | 48 | 8 | 6 | Lack of Using free capacity of production to increase revenue of products sale increase                     |  |  |
|  | 16 | 8 | 2 | Lack of using specialized people in human resources to improve motivation and job satisfaction of personnel |  |  |
|  | 64 | 8 | 8 | Lack of serious presence in spare parts market  |  |  |
|  | 9  | 9 | 1 | Lack of taking sale agency of similar foreign products in current industry                                  |  |  |
|  | 4  | 4 | 1 | Lack of Reduction of fixed and varied organizational costs  |  |  |
|  | 3  | 3 | 1 | Lack of Tear one projects   |  |  |

**Table 7- FMEA of weakness**

| Analysis of failure modes in strategy formulation          |     |   |   |  |                               |                                       |
|--|-----|---|---|--|-------------------------------|---------------------------------------|
| Goal/Subject: Reduction of products costs                  |     |   |   |  |                               |                                       |
| Proposed actions   | RPN | O | S | Failure potential reasons  | Potential failure effects     | Potential failure modes               |
| Determining prioritized strategies to execute in RPN score | 12  | 4 | 3 | Lack of using free capacity of production for activity in spare parts market                           | Lack of achieving macro goals | Lack of success in reduction of costs |
|  | 32  | 8 | 4 | Lack of Increase of production share in market OEM by licensed production of a valid foreign company.  |                               |                                       |
|  | 18  | 6 | 3 | Lack of Employment or consulting of authorities to increase productivity of production to reduce costs |                               |                                       |
|  | 24  | 8 | 3 | Lack of Using free capacity of production to increase revenue of products sale increase                |                               |                                       |





|  |    |   |   |   |  |  |
|--|----|---|---|---|--|--|
|  | 16 | 8 | 2 | Lack of using specialized people in human resources to improve motivation and job satisfaction of personnel |  |  |
|  | 32 | 8 | 4 | Lack of serious presence in spare parts market  |  |  |
|  | 9  | 9 | 1 | Lack of taking sale agency of similar foreign products in current industry                                  |  |  |
|  | 28 | 4 | 7 | Lack of Reduction of fixed and varied organizational costs  |  |  |
|  | 18 | 3 | 6 | Lack of Tear one projects   |  |  |

**Table 8-Organizational strategies at macro level**

| RPN | Strategy  | No |
|-----|---|----|
| 72  | Serious presence in spare parts market  | 1  |
| 48  | Using free capacity of production to increase revenue of products sale increase                     | 2  |
| 32  | Increase of production share in market OEM by licensed production of a valid foreign company.       | 3  |
| 28  | Reduction of fixed and varied organizational costs  | 4  |
| 24  | Lack of Increasing productivity in manufacturing processes and reduction of products costs          | 5  |
| 24  | Using specialized people in human resources to improve motivation and job satisfaction of personnel | 6  |
| 20  | Taking sale agency of similar foreign products in current industry                                  | 7  |
| 20  | Increasing productivity and improvement in manufacturing processes                                  | 8  |
| 18  | Employment or consulting of authorities to increase productivity of production to reduce costs      | 9  |
| 18  | Tear one projects   | 10 |
| 9   | Taking sale agency of similar foreign products in current industry                                  | 11 |

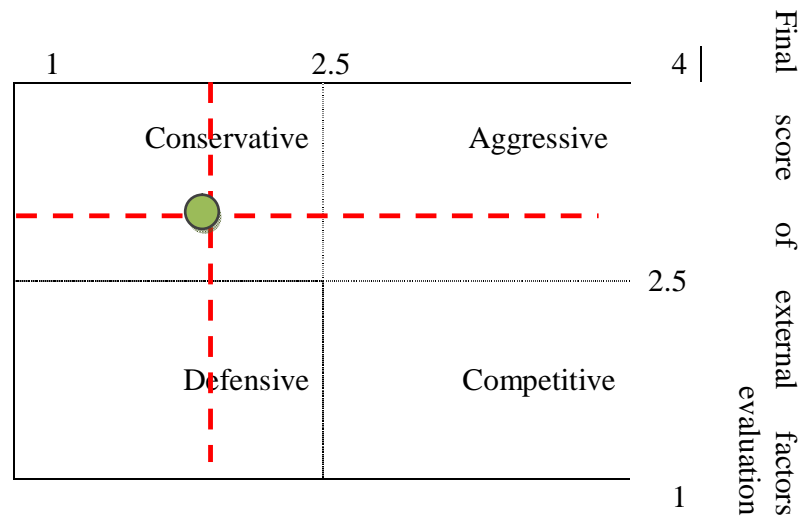
**Chart 1- Internal and external matrix**





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The final score of internal factors evaluation



| SWOT matrix at macro level                                     |  | External factors evaluation matrix) (EFE) |
|--|--|---|
| Weaknesses   | Strengths  |   |
| Liquidity problem  | Quality management system  | Internal factors evaluation) (IFE)        |
| Lack of marketing unit and specialized sale                    | The lab of performance test and disc life service and manufacturing discs of organization              |   |
| Lack of activity in spare parts market                         | Establishment of test devices in some of important central agencies of automotive companies of country |   |
| Lack of using free production capacity                         | The presence of production free capacity   |   |
| Lack of considering human resources                            | Relationship with qualitative authorities of automotive companies                                      |   |
| Problem of providing raw materials and services in the country |  |   |





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| Single source suppliers  |  |  |
|--|--|--|
| Strategies <b>WO</b>   | Strategies <b>SO</b>   | Opportunities  |
| Using free capacity of production to increase revenue of products sale increase<br>Increasing productivity in manufacturing processes and reduction of products costs<br>Using specialized people in human resources to improve motivation and job satisfaction of personnel<br>Serious presence in spare parts market | Increase of production share in market OEM by licensed production of a valid foreign company.<br>Using free capacity of production for activity in spare parts market<br>Employment or consulting of authorities to increase productivity of production to reduce costs. | The scientific centers and increasing mean of education<br><br>Spare parts market<br><br>Licensed production   |
| <b>WT strategies</b>   | <b>ST Strategies</b>   | Threats  |
| Taking sale agency of similar foreign products in current industry<br>Reduction of fixed and varied organizational costs<br>Tear one projects  | Increasing productivity and improvement in manufacturing processes<br>Using free production capacity to increase the revenue of products sale increase   | Inflation rate increase<br>Economic sanction<br>Instability of tax rules and increase of tax pressures<br>Lack of timely payment of claims of automotive companies<br>Instability of import in country |







## The Effects of Stock Return Volatility on the Stock Return Performance

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Received: 29 Mar 2015

Revised: 25 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

This article aims to investigate the effect of stock return volatility on the stock return performance of companies. This is an analytical causal library study is based on panel data analysis. The article has used financial information of 105 companies listed in Tehran Stock Exchange during the period 1386 to 1391 (2007-2012) (630 firm-years). SPSS 20, Eviews, and Minitab 16 have been used to analyze data. The results of analyses in this study indicate that there is a significant and direct relationship between volatility of stock returns and stock returns performance.

**Key words:** volatility of stock returns, stock returns, volatility of stock returns because of data panel.

## INTRODUCTION

Financial market is one of the most important markets in every country. The markets' conditions strongly affect the real economic sectors, and they are affected by the other sectors as well. Stock market is an essential part of financial markets; stock market is one of the main channels for investment in the world so that the pulse of world markets beats in major stock markets of commodities and securities (Humphery, 2012). Money and capital markets, as pillars of the financial sector, are responsible for financing the real sectors of the economy (Lee, 2011). The efficiency of the financial sector will lead to optimal allocation of scarce resources economic activity. Optimal allocation of resources, in turn, will lead to optimality of savings and investments, and consequently, the growth of the national economy close to the potential capacity of the economy (Ferreira & Matos, 2008). Companies listed on the Stock Exchange of Iran pay particular attention to positive volatility of stock returns in line with their policies for people's participation in investments, pushing the stagnant and unproductive capital to productive economic activities, meeting the financial needs of manufacturing firms, and the supply of goods needed by the society. Changing the risk of return



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on investment due to volatility in macroeconomic variables can affect the investment options (Bird & Yeung, 2012). Investors attempted to invest in the hope of achieving more wealth. The rate of return on stocks is important factors that investors consider in their decision-making (Baker et al., 2011). In the investment, return is a driving force that will motivate and reward for investors (Kuo & Lin, 2012). In fact, every investor should first be sure that the principal capital would return; then, his expected return would meet. In this case, he will invest (Alexander & Barbosa, 2007).

Return on equity is the ratio of total income (or loss) from investments and the capital used to earn revenue in a given period. The period can be a day, a month, a year, etc. Various measures have been proposed to evaluate performance of business units; one of the most common and most important criteria for assessing the rate of profitability of the institution's performance is return on equity, which plays a key role in investment. This measure has only provided contents of information for investors and it has been used to evaluate the performance and operation of a commercial units. The reduction of measure is regarded as an alarm for company and it indicates that performance is not appropriate. This measure may have more contents of the information than accounting based measures of performance because market base evaluation of performance does not reflect information for investors properly. Rate of return on an investment is a concept that has different meanings for different investors. Some companies are looking for short-term cash returns and long-term returns are worthless for them. Such companies may buy shares of companies that pay high dividends in cash. Some investors care primarily to growth and development. These investors invest in companies that have a high return on equity or net worth. Francis et al (2008) believe that investment a money transfer expected to be followed by additional money. Every investment involves a degree of risk that entails the loss of the money in the present to obtain its benefits. Indeed, return is the main variable in the decision to invest. Return is a factor to compare real benefit that generated by the various investments with the necessary return to compensate for investment risk. Given the importance of the issue, the stock market acts as an indexes of evaluating economic status in a country that brings an increase in investment in this market; attracting investment in capital market requires an increase in the efficiency of the stock market, risk reduction and the creation of favorable conditions for investment. Since macroeconomic variables such as exchange rates, inflation, oil prices etc. influence on return on the stock market, definiteness of the relationship between economic variables and the stock market can be useful for future managers and investors in decision making.

**The Importance and Necessity of Research**

Since the age of Adam Smith, most scholars believe about organizations that they gain their power from investors, employees and suppliers to produce goods and services to customers (Ferreira & Matos, 2008). In this perspective, company performance is the financial returns reached to shareholders. Every person has made a decision about investment in various fields such as real estate, gold, stocks, etc. In every scientific decision, selection depends directly on the degree of risk and return opportunities compared to other investment opportunities (Francis et al., 2008). In other words, the main purpose is to identify investment opportunities that have the highest return with the same risk or low risk in terms of equal return (Humphery, 2012). Therefore, the importance of predicting stock returns has motivated researchers to seek variables that are significantly associated with stock return as well as the variables that affect the relationship. They have always sought to find effective factors of return to make proper decisions. The results of the research in this area show that both financial and non-financial information are effective on return on equity (Mehrani et al., 2004). Thus, stock return is an index to measure the performance of companies because the most important factor for assessing the performance of companies is stock return (Lee, 2011). This criterion has information for investors and used to evaluate performance (Petersen, 2009). The reduction of measure is regarded as an alarm for company and it indicates that performance is not appropriate. The criterion has many contents of information because accounting based measures of performance because market base evaluation of performance does reflect information for investors properly. Given the importance of stock return, this article investigates the effect of stock return volatility on the stock return performance of companies listed in Tehran Stock Exchange.





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## LITERATURE REVIEW

Barnes (2013) investigated the relationship between volatility of quarterly earnings and the market value of the company. The obtained results of this study suggest a negative relationship between the volatility of earnings and the market value of the company. In "Strategic benchmarks in earnings announcements," Schrand and Walther (2012) examined the relationship between the volatility of cash flows and future cash flows and earnings with respect to low investment incentives. They concluded that volatility of operating cash flow has a negative relationship with future cash flows and earnings. Böhle et al. (2012) checked the relationship between institutional investors and stock return volatility. Their findings indicate that increase in institutional ownership has stabilized effect on the volatility of stock returns because they adjust stock prices quickly to new information and make the stock market more efficient. In Babajani et al (2012) investigated the effect of the reliability of accruals on stock returns. It is a practical and correlation study having been implemented in the form of panel data. Its statistical population contains companies listed in Tehran Stock Exchange in the period 201 to 2008; it contains 141 companies. The results show that there are stronger relationships among the current period interest accruals with lower reliability. In "The announced information content and the anticipated dividend per share in explaining abnormal returns," Salehi et al. (2014) concluded that there is a significant direct relationship between indexes of earnings per share subscription and earnings per share forecast to show abnormal stock returns. Moreover, the results confirm more information content for announced earning of each share comparing to expected earnings per share. Reza Tehrani (2013) examined the relationship between exchange rate volatility and stock return of exporting firms listed on Tehran Stock Exchange between the years 2007 to 2009. After analyzing the data durability, research hypotheses about the effects of simultaneous interruption of this relationship has investigated using panel data, multiple regression analysis by E-Views software and panel data models. The results indicate the positive effect of exchange rate fluctuations along the return on equity of these companies; no relationship was found between exchange rate fluctuations and stock return of a time lag. In his article titled "The quality of financial reporting and volatility of unusual stock yields," Behzad Ghorbani et al (2013) conducted a research during 2001-2010). He concluded that the quality of financial reporting has adverse effects on the returns of conventional stock volatility. In addition, the findings indicate the direct effect of variables of annual return on equity, financial leverage, and next-year operating cash flow on the volatility of unconventional stock returns. The firm size had also reverse impact on the volatility of unconventional stock returns.

## RESEARCH METHODS

105 of 510 listed companies in Tehran Stock Exchange (up to 20, March 2013) have been selected. The effects of 1 independent variable and 8 control variables on stock returns have been studied in this research. Table 1 shows the descriptive statistics of the studied variables. The table indicates that the number of samples is 630, the mean of stock return is 0.51, and the standard deviation is 0.345.

A model is designed to investigate the research hypothesis. They are shown in the following:

**Hypothesis** There is a significant relationship between volatility of stock returns and stock return of company.

### Model 1

$$StoRet_{i,t} = \alpha_0 + \beta_1 VolQM_{i,t} + \beta_2 Ln(Ass)_{i,t} + \beta_3 EBIT / Ass_{i,t} + \beta_4 Q_{i,t} + \beta_5 CurRat_{i,t} + \beta_6 Acq_{i,t} + \beta_7 Debt / Ass_{i,t} + \beta_8 CAPEX / Sal_{i,t} + \beta_9 Int / Ass_{i,t} + \varepsilon_{i,t}$$





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#### Operational definitions of the dependent variable

**Stock returns** ( $Sto Re t_{i,t}$ ): Exchange Organization will use the following formula to measure real return on securities.

$$Sto Re t_{i,t} = \frac{(p_t - p_{t-1}) + DPS_t + SO_t + SR_t}{P_{t-1}}$$

$RET_{i,t}$ : Returns of the company  $i$  within the time period  $t$ .

$P_t$ : Price ratio at the end of period  $t$ .

$P_{t-1}$ : Price per share at the end of period  $t-1$ .

$DPS_t$ : Dividend per share for the period  $t$ .

$SO_t$ : The value of Sale option granted for the period  $t$ .

$SR_t$ : The value of shares priority granted within the time period  $t$ .

#### Operational definitions of independent variables

##### Volatility of stock returns ( $VolQM_{i,t}$ )

According to Humphery (2012), the volatility of stock returns will be calculated as follows:

$$VolQM_{i,t} = GR_{i,t} * GP_{i,t}$$

Where:

$$GR_{i,t} = \frac{R_{i,t} - R_{i,t-1}}{R_{i,t-1}}$$

$GR_{i,t}$ : The growth rate of the stock return of firm  $i$  in year  $t$ .

$R_{i,t}$ : Return on stocks of firm  $i$  in year  $t$ .

$R_{i,t-1}$ : Return on stocks of firm  $i$  in year  $t-1$ .

And:

$$GP_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$$

$GP_{i,t}$ : The growth rate of stock price in company  $i$  in year  $t$ .





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$P_{i,t}$  : The stock prices of firm i in year t.

$P_{i,t-1}$ : The stock prices of firm i in year t-1.

**Operational definitions of control variables:**

**Firm size ( $Ln(Ass)_{i,t}$ )**

It is equal to natural logarithm of the book value of total assets (Blake et al., 2010).

**Return on assets ( $EBIT / Ass_{i,t}$ ):**

According to Martin (2012), the following formula is used to calculate return on assets:

$$EBIT / Ass_{i,t} = \frac{\text{Earnings before interest and tax deductions}}{\text{The book value of total assets}}$$

**Tobin's Q ratio ( $Q_{i,t}$ )**

To calculate Tobin's Q ratio, Bali and Kakli (2008) have used the following trend:

$$Q_{i,t} = \frac{(\text{Stock market value} + \text{Book value of total assets}) - \text{Book value of stock}}{\text{Book value of total assets}}$$

**Current ratio ( $CurRat_{i,t}$ )**

According to Ang et al, (2009), it is equal to

$$CurRat_{i,t} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

**Dummy variable of stock acquisition ( $Acq_{i,t}$ )**

Dummy variable is equal to one in the studied company had earned stocks, otherwise it is equal to zero (Gao & Lin, 2012).





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**Financial Leverage ( $Debt / Ass_{i,t}$ )**

Koming and Juhan’s study (2011) has been used in this research to calculate financial leverage:

$$Debt / As = \frac{\text{Book value of total liabilities}}{\text{The book value of total assets}}$$

**Capital expenditures ( $CAPEX / Sal_{i,t}$ )**

Kerkolen et al. (2012) has been used to calculate capital expenditures; it is as following:

$$CAPEX = \text{Book value of the assets in the year } t - \text{Book value of the assets in the year } t-1.$$

Then, the ratio of capital expenditures is:

$$CAPEX / Sal_{i,t} = \frac{\text{Capital expenditures}}{\text{Company sales}}$$

All statistical methods are based on some assumptions; it is essential to investigate and establish the validity of assumptions used in the statistical methods. Panel data method is not exempt from this rule. The results of Jarque Bera test in the Table 4 indicate that residues resulting from the estimation of research models are distributed normally. According to the significance level based on Breusch-Pagan test in Table 2 that are lower than 0.05, the null hypothesis that there is consistency variance is rejected. It can be said that the model has the problem of variance inconsistency. Generalized least squares (GLS) estimation method is used to resolve this problem in the estimated model. According to autocorrelation test of model residues by Durbin–Watson statistic (DW), the remainders are independent of each other. In addition, since the significance level of Ramsey test in Table 2 for the model is greater than 0.05, the null hypothesis about model linearity is confirmed and the model has no specification error.

As the data of the study is in form of panel, the goodness of fit for data should be investigated with respect to OLS regression, fixed effects or random effects. Chow and Hausman tests have been used in this regard. Table 3 represents the results of these two tests. According to Table 3, Chow tests indicate that panel data is more efficient than OLS regression; Hausman test determines that fixed effects model is more useful than random effects model.

Table 4 shows panel model fitness of fixed effects (sectional fixed effects) for the data in Model 1. Results reported in Table 4 show that the model linear regression is significant and the coefficient of determination for model 1 is 50%. It is worth noting that the coefficient of determination shows the extent to which the independent variables describe the distribution of the dependent variable. Results of Table 4 show that volatility of stock returns in model 1 has significant and direct influence on stock returns; if volatility changes one unit, the stock returns rate will increase 0.0693.





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#### Model 1

$$\frac{\partial(\text{StoRet}_{i,t})}{\partial(\text{VolQM}_{i,t})} = \beta_1 = 0.0693$$

## CONCLUSION

#### The results of testing research hypothesis

In terms of studying the significance of whole model, as F-statistics is less than 0.05 (0.0000), the model is confirmed with 95% significance level. Determination coefficient of the model indicates that 50.13% of stock returns are explained by the variables in the model. According to the significance of coefficients and since t-statistics of variables of stock returns volatility is less than 0.05 (0.0000), the results confirm the significance of the relationship between volatility of stock returns and stock returns at 95% significance level. Therefore, the research hypothesis is confirmed and it is possible to say with 95% confidence that there is a significant relationship between volatility of stock returns and stock returns. Positive coefficient of this variable (0.0693) indicates a direct relationship between the volatility of stock returns and stock returns so that if volatility changes one unit, the stock returns rate will increase 0.0693. Consequently, according to the analysis made in connection with the hypothesis of this study one can conclude that there is a significant and positive relationship between the volatility of stock returns and stock returns in companies.

#### Research Suggestions

1. According to the results of this study and similar studies, Stock exchange organization can release comprehensive information on the operational performance and stock returns for shareholders.
2. It is suggested for accounting standards authorities to disclose voluntarily comprehensive information on the level and volatility of stock returns as well as volatility of stock returns arising from operational performance stock returns of companies.
3. It is better for active financial analysts in the capital market and investment Advisors in the stock exchanges to present particular analyses according to operational performance and stock return status, actors affecting stock returns, and volatility of stock returns arising from operational performance stock returns of companies in addition to conventional analyses and techniques.

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**Table 1: Descriptive statistics of the variables**

| Variable                            | Symbol              | Variable type | Number of samples | Mean   | Standard deviation | Minimum | Maximum | Skewness | Elongation |
|-------------------------------------|---------------------|---------------|-------------------|--------|--------------------|---------|---------|----------|------------|
| Stock returns                       | $StoRet_{i,t}$      | Dependent     | 630               | 0.5138 | 0.3456             | 0.0025  | 2.8231  | 1.472    | 5.584      |
| Volatility of stock returns         | $VolQM_{i,t}$       | Independent   | 630               | 0.5468 | 0.7034             | 0.0003  | 6.9505  | 3.281    | 19.805     |
| Firm size                           | $Ln(Ass)_{i,t}$     | Control       | 630               | 5.9149 | 0.6134             | 4.7761  | 8.0074  | 0.718    | 0.547      |
| Return on assets                    | $EBIT / Ass_{i,t}$  | Control       | 630               | 1.0363 | 0.3601             | 0.0213  | 1.7999  | -0.673   | 0.250      |
| Q-Tobin ratio                       | $Q_{i,t}$           | Control       | 630               | 1.5510 | 0.8089             | 0.6121  | 8.2998  | 2.673    | 11.810     |
| Current ratio                       | $CurRat_{i,t}$      | Control       | 630               | 0.1634 | 0.1404             | 0.0001  | 0.8600  | 1.709    | 3.451      |
| Dummy variable of stock acquisition | $Acq_{i,t}$         | Control       | 630               | 0.4777 | 0.4999             | 0.0000  | 1.0000  | 0.089    | -1.998     |
| Financial Leverage                  | $Debt / Ass_{i,t}$  | Control       | 630               | 0.6286 | 0.2336             | 0.0964  | 2.7553  | 2.010    | 14.744     |
| Capital expenditures                | $CAPEX / Sal_{i,t}$ | Control       | 630               | 0.6279 | 0.6306             | 0.0003  | 2.9980  | 1.440    | 1.696      |
| Tangible assets ratio               | $Int / Ass_{i,t}$   | Control       | 630               | 0.2500 | 0.1680             | 0.0008  | 0.8786  | 1.035    | 0.679      |







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**Table 2: The underlying panel pattern**

| Model | Ramsey statistics |        | Durbin-Watson statistics | Breusch-Pagan statistics |        | Jarque-Bera statistics |          |
|-------|-------------------|--------|--------------------------|--------------------------|--------|------------------------|----------|
|       | Possibility       | F      | D                        | Possibility              | F      | Possibility            | $\chi^2$ |
| 1     | 0.0778            | 2.5644 | 2.05                     | 0.0044                   | 2.6833 | 0.2587                 | 1.3512   |

**Table 3: Chow and Hausman tests**

| Test    | Statistics | Model No. | Base   | Degree of freedom | Possibility |
|---------|------------|-----------|--------|-------------------|-------------|
| Chow    | F          | 1         | 4.0774 | (516,104)         | 0.0000      |
| Hausman | $\chi^2$   | 2         | 7.3992 | 9                 | 0.0056      |

**Table 4: Estimation of parameters of models 1**

| Model No.                         | 1           |              |
|-----------------------------------|-------------|--------------|
| Variable                          | Coefficient | t-statistics |
| intercept                         | 0.5386      | 3.8112*      |
| $VolQM_{i,t}$                     | 0.0693      | 5.2622*      |
| $VolQM_{i,t} * OpePer_{i,t}$      | -           | -            |
| $Ln(Ass)_{i,t}$                   | 0.0022      | 0.1047       |
| $EBIT / Ass_{i,t}$                | -0.0413     | -1.1920      |
| $Q_{i,t}$                         | -0.0069     | -0.3499      |
| $CurRat_{i,t}$                    | -0.0122     | -0.1582      |
| $Acq_{i,t}$                       | -0.0185     | -1.0914      |
| $Debt / Ass_{i,t}$                | 0.0093      | 0.1651       |
| $CAPEX / Sal_{i,t}$               | 0.0391      | 2.5508*      |
| $Int / Ass_{i,t}$                 | -0.1666     | -2.4144*     |
| variance analysis of F-statistics | 4.5902*     |              |
| Coefficient of determination      | 0.5013      |              |

\* Signifies the significance at the level of 5 percent





## New Structural System for Design or Retrofitting of Bridge Piers for Lateral Loading Conditions

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Received: 26 Mar 2015

Revised: 30 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

A new structural system for bridge piers is presented that provides more resistance for lateral loading conditions in comparison with conventional systems. The structural response of piers in long- and medium-span bridges has been studied with new and conventional systems. A comparative study is carried out through static pushover analysis and reveals the new system has a higher load-carrying capacity compared with the conventional system. A probabilistic analysis of the structural collapse is carried out through incremental dynamic analysis (IDA) to quantify reliability indexes. The results from IDA analyses show higher seismic safety for the new system in comparison with the conventional system. Also conducted is a time history analyses for near-field earthquake ground motions. The results indicate that the overall stiffness degradation observed in the conventional system caused more damage than the overall stiffness degradation observed in the new system.

**Key words:** incremental dynamic analyses, probabilistic analysis, reliability index, structural collapse.



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## INTRODUCTION

Continuous service of infrastructure is one of the main concerns in the design codes. Nevertheless, structural safety is threatened by accidental loads, which are more important due to recent global environmental changes. Amongst the structures bridges are vulnerable to the accidental loads (Zanini et al (2013), Billah, Scanlan (1991)) and earthquake loading is one of the major accidental loads causing collapses in bridges. These types of loads are random and difficult to predict, and there is possibility of much higher forces compared with the capacity of the structure. Considering the random characteristics of these types of loads, many studies have been performed using risk analysis techniques for better estimation of the probable loads to improve the reliability of the design procedure (Chavel, Yadlosky (2011) ; Nowak (2009)).

In this paper, a new structural system is introduced that provides an alternate path for carrying the vertical and horizontal loads by bridge piers to avoid collapse of the structure due to accidental loads. This new structural system consists of three parts: internal, middle and external parts. A general view of the proposed system is shown in Fig. 1. While the external part absorbs exerted dynamic force in the case of a lateral force or ground motion as a result of its higher moment of inertia, the internal part provides stability to the system for the vertical loads by providing enough cross-sectional capacity.

### General description of the bridges for the case study

Four Typical piers from seventeen bridges with medium span length of 1181.10 and 1574.80 in. [30000 and 40000 mm] and a long span bridge with the length of 12598.42 in. [320000 mm] with two piers are considered for comparing the structural response of the new and conventional systems. The medium span bridges consisting of two passing lanes and the superstructure include a 9.85-inch-thick [250 mm] reinforced concrete slab and six T-shaped pre-stressed beams. The substructure includes a pier cap supporting the beams and two circular columns. The pier heights are 393.70 in. [10000 mm] (Pier 1 Case), 531.49 in. [13500 mm] (Pier 2 Case), 551.18 in. [14000 mm] (Pier 3 Case) and 629.92 in. [16000 mm] (Pier 4 Case). Span length of the bridges for piers 1 and 4 is 1181.10 in. [30000 mm] and it is 1574.80 in. [40000 mm] for piers 2 and 3. Except from pier 1, the columns for piers 2, 3 and 4 are divided by a beam which is elevated 295.27 [7500 mm], 275.59 [7000 mm] and 354.33 [9000 mm] inches from the top of the foundation. At each pier location, one span is free to slide longitudinally, while the other span is fixed along the axis of the structure. The geometry of piers 1 to 4 is shown in Fig. 2a. The second model is a 12559.50-inch [319000 mm] long continuous bridge, which is named BR-05. This is a pre-stressed concrete bridge with three spans, including two 3267.71 in. [83000 mm] side spans and a 6023.62 in. [153000 mm] span in the middle. The superstructure of the bridge includes three passing lanes of an elevated 515.74 in. [13100 mm] wide viaduct that is supported by single-column bents. The geometry of the BR-05 is shown in Fig. 2b.

### Analytical model of the bridges

Two pieces of software, ZEUS-NL (Elanashai et al (2011)) developed at the Mid-America Earthquake Centre and SAP 2000 (Computers and structures Inc (2008)) are utilised to perform the nonlinear analyses. The finite element software, Section Builder (Computers and structure Inc (2003)), is used for designing the structural elements. The bridge is designed to carry conventional loads and also for a seismic zone IV according to AASHTO (American Institution of Steel Construction Inc (2010)), with a design acceleration coefficient of 0.35g. In addition to using AASHTO as a design code for bridges, ANSI/AISC 360-10 (American Association of state highway and transportation officials (2013)) is also considered for designing the piers of the new system, which consists of steel and concrete composite sections.

The internal part is designed just to carry the dead load. Load combinations are considered for designing the pier according to AASHTO for the combined action of both internal and external parts. Cross sections of the piers for the



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new and conventional system are shown in Fig.3. Two material models of StI2 (Ramberg-Osgood model with a Masing-type hysteresis curve) and Con2 (Uniaxial constant confinement concrete model) from the material library of ZEUS-NL are considered for the nonlinear behaviour. Con2 and StI2 are utilised for concrete and steel elements, respectively.

A three dimensional model of the BR-05 Bridge is assembled for dynamic analyses using SAP2000. Nonlinear-Layered Shell elements are utilised in the SAP2000 model for the piers and deck. Pier heights are 1102.26 in. [28000 mm] and 2559.05 [65000 mm] for Piers 5 and 6, respectively. The cross section of the piers is reinforced-concrete twin hollow boxes. A shell element with a nonlinear in-plane and out-of-plane element component behaviour is chosen for reinforced concrete pier walls. Five layers for concrete and two equivalent rebar layers for reinforcement are adopted for the layered shell element. The cross section of the piers for both the new and conventional system is shown in Fig. 4. Joints at the bearings are restrained to provide the required boundary conditions. The deck is seated on fixed and movable bearings. The bearings are movable for the abutments and Pier 5, whilst the other pier (Pier 6) has a fixed bearing. The joints at the pier foundation are restrained to provide fixed supports as they are considered to be located on competent rock.

**Analytical investigation**

To evaluate the structural behaviour of the new and conventional systems, pushover and time history analyses are carried out. Three earthquake ground motions (International Code Council (2009)). are taken into account to evaluate the structural response to seismic conditions in Br-05 as a long span bridge. Incremental Dynamic Analyses (Lin, Baker (2013)) is conducted for assessment of the seismic collapse safety of the piers in medium span bridges. Global performance criteria for failure are adopted as a drift of 3% and a degradation of lateral resistance of more than 10% (Haselton et al (2011) ; Mwafy et al (2007)).

**Static push-over analyses**

Static pushover analyses are performed to investigate the general load-deflection relationship and load-carrying capacity for the piers of medium span bridges (Moschonas, Kappos (2013)). Pushover analysis is conducted by applying the load at top of the piers. The structural response is presented in Fig 5.

Generally, the results show a much higher capacity for the new structural system in comparison with the conventional system. The results for the new system show almost twice as much capacity as the conventional system. The over-strength factor, which is defined as the ratio of the maximum base shear resistance to the design base shear, is almost twice for the new system in comparison with the conventional system. A comparison of the results for the over-strength factor is shown in Table 1.

**Incremental dynamic analyses (IDA)**

IDA analyses considering horizontal components

For evaluating the likelihood of earthquake-induced collapse in the piers, performance-based engineering methods are applied. This method relates the structural response to the ground motion intensity through probabilistic assessment of the results from nonlinear dynamic analyses. Structural safety is evaluated through collapse performance assessment. An incremental dynamic analysis (IDA) is conducted for collapse assessment of the piers for medium span bridges (Haselton et al (2011)). The piers are subjected to analysis under multiple ground motions that are scaled to increasing intensities. The ground motion set that is utilised for performing nonlinear analyses is the far-field ground motion set used in FEMA P-695 (Federal Emergency Management Agency (2009)). The far-field record set



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includes twenty-two records (44 individual horizontal components) from large-magnitude earthquakes (magnitude of 6.5-7.6) and the record selection criteria for this ground motion set are documented in Haseltone and Deierlein (Haseltone et al (2008)). Ground motion records are selected and anchored to specific ground motion intensity such that the median spectral acceleration of the record set matches the spectral acceleration at the first mode period of each pier that is being analysed.

Nonlinear response history analyses are conducted under the factored gravity load combination in FEMA P-695. Horizontal components of ground motions are applied to the piers by using the IDA approach. Individual ground motions are scaled to increasing intensities until the structure reaches a collapse point, which is considered dynamic instability. Collapse under each ground motion is judged to occur from the dynamic analysis results as evidenced by excessive lateral displacements (sideways collapse) and loss of strength, which are a drift of 3% and a degradation of lateral resistance of more than 10%. Sample results from an incremental dynamic analysis for pier 4 is depicted in Figs.6 (a, b) for the new and conventional systems.

A collapse fragility function can be defined through a cumulative distribution function (CDF) by using data from IDA results. The fragility curve relates the ground motion intensity to the probability of collapse (Ibarra et al (2005)). Figs.6 (c, d) present the fragility curve, which is obtained by fitting a lognormal distribution through the collapse data points.

The two parameters of median collapse capacity and collapse margin ratio are computed from analysis results. The median collapse capacity is computed as the spectral intensity when half of the ground motions cause the structure to collapse. Uncertainty effects are neglected in this study, as the main purpose is comparing the structural behaviour of the two systems. The ratio between the median collapse intensity and the ground-motion intensity, with a 2% chance of exceeding in 50 years, is the collapse margin ratio. The ground-motion intensity is taken directly from the response spectrum (AASHTO). The results for the seismic collapse assessment of the piers are summarized in Table 1.

An assessment of the results reveals that both of the key metrics the median collapse capacity and the collapse margin ratio for the new system are larger than the conventional system within a reasonable limit that provides a higher seismic safety for the new system.

#### IDA analyses considering vertical and horizontal components

Another IDA analyses is carried out to evaluate effects of vertical components of the earthquake ground motions for the new and conventional systems. Both of the vertical and horizontal components applied to the structure. Eleven ground motions with available vertical and horizontal components from the far-field data series used in FEMA P-695 are selected for the analyses. Record selection is considered based on availability for both of the vertical and horizontal records in the PEER ground motion database. Horizontal components are selected and anchored to specific ground motion intensity such that the median spectral acceleration of the record set matches the spectral acceleration at the first mode period of each pier. Vertical components are amplitude scaled according to the spectral acceleration at the first-mode period of horizontal components. This provides a comparable tool for evaluating structural response of the new and conventional systems under effects of earthquake ground motion intensities. The ground motions are increasingly scaled until collapse occurs. The dynamic response of the pier 4 is presented in term of Shear force-Displacement response, shown in Fig. 7.

Two approaches are considered for comparison of the structural response for the new and conventional system. For one case, the results gained from IDA analyses of horizontal-only excitation are compared with the results of coincident motion for each of the new and conventional system separately. Comparison of the results in Fig. 7(a, b) indicates that except from some marginal differences, the general trend is almost the same for analyses of the new



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system with and without vertical component. The vertical motion generated fluctuating axial forces in the piers resulting in fluctuating shear capacity of the pier. Shear force ranges between 12000 to 15000 KN with the case of horizontal-only excitation, while the force exceeds these values due to inclusion of vertical component. The results for the conventional system reveal that much more fluctuation is observed in the conventional system for the case with combination of horizontal and vertical accelerations in comparison with the horizontal case only. No significant changes are observed for displacement response. Fig.7 (c, d) compares the shear force-Displacement response of the conventional system with and without vertical component. Values of horizontal response quantities are significantly influenced by vertical ground motion. Shear force ranges between 7300 to 7900 KN for the conventional system without horizontal-only component, while it ranges from 6700 to 8700 KN when vertical motion is included. Despite high fluctuation for the shear force, displacement response of the pier is not affected significantly with and without vertical excitation.

The IDA results of the pier case 4 are shown in Fig. 8. Both of the new and conventional system show more fluctuation when vertical ground motion is included. Except from some marginal reduction in the capacity for the new system with vertical component the result doesn't show significant changes with and without vertical component. Results including vertical motion for the conventional system show reduction in the shear capacity for some cases, while there is no significant change for most of the cases.

For the second approach the results of the new system and conventional system are compared to each other. Generally the new system shows higher capacity compared to the conventional system. More fluctuation is observed in the shear force for the new system in comparison with the conventional system with the case of horizontal-only excitation. Dynamic response of the conventional system affects significantly due to inclusion of vertical component, while no significant changes are observed for the new system. Although the shear force results vary when the vertical motion is included, the displacement response remains almost the same for both of the systems apart from some cases for the conventional system. Despite marginal changes for the IDA results especially for the conventional system, the general trend remains almost the same for both of the systems with and without vertical component.

**Nonlinear dynamic time history analyses**

The structural response of the BR-05 model for the new and conventional system is compared through nonlinear dynamic analyses. The input motions employed in the following dynamic analyses are an acceleration time history of Imperial Valley (El Centro), Northridge and Kobe, which are selected from PEER strong ground motion database (Pacific Earthquake Engineering Research Centre (2011)). The corresponding peak ground accelerations for transverse, longitudinal and vertical components are shown in Table 2. Because most of the strong motion occurred during the first 20 seconds of each ground motion, just this part is considered in the analysis.

Fig.9 depicts the hysteretic response of pier 2 for the three ground motions. Generally, different energy absorption and dissipation capacity values are observed for both systems. The difference is especially significant for the Northridge and Kobe ground motions, in which a significant reduction in energy dissipation capacity and stiffness degradation is observed. This can be due to the large cycle of loading and pronounced pinching during reloading.

The displacement response of the conventional system is larger than that of the new system for all three ground motions. In addition to less deformation, a higher shear force is observed for the new system. This reflects the fact that, response characteristics, particularly stiffness, are significantly affected in the new system and a more severe damage pattern is observed in the conventional system. As a result, comparing the observed damage pattern and the stiffness degradation for the two systems shows an improved seismic behaviour for the new system.





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## SUMMARY AND CONCLUSION

A new structural system is developed and implemented for bridge piers. To investigate the structural behaviour of the new system, two different types of bridges with medium and long spans are analysed. A static pushover analysis is carried out to compare the ultimate capacity of the new system with the conventional system. Incremental dynamic analyses are conducted to evaluate the seismic collapse safety of the new and conventional systems. Further to the normal IDA analyses which considers horizontal ground motions another IDA analysis is carried out considering vertical and horizontal ground motions to evaluate structural response with and without vertical component. Also conducted is a nonlinear time history analysis to evaluate the seismic response of the new and conventional systems under three earthquake ground motions for a long span bridge.

In general, the structural response shows more stability for the new system in terms of strength and stiffness degradation within a reasonable limit compared to the conventional system. An evaluation of pushover analyses reveals that the ultimate capacity of the new system is higher than the conventional system. Over-strength factors for the new system are approximately two times larger than those of the conventional system. A probabilistic assessment of the safety indicates that the new system has a higher collapse safety than the conventional system and that piers built with the new system are able to withstand higher ground motion intensities. Both key metrics the median collapse capacity and the collapse margin ratio are larger for the new system compared with the conventional system. Analyses results also reveal that the new system has higher capacity and collapse safety when the vertical ground motion is included. The hysteretic response resulting from shear-displacement of the model exhibits pronounced stiffness degradation for the conventional system. A significant degradation in strength is observed once the maximum cycle occurs, leading to a reduction in energy dissipation for the conventional system. Utilisation of the new system has a direct effect on the damage pattern of the piers by reducing the deformation and increasing the shear capacity. A higher displacement in the conventional system eventually leads to overall stiffness degradation that more comprehensively describes the damage pattern than does the new system.

The new system presented in this paper has the ability to be utilized for either the design of new bridges or the strengthening of existing bridges. The ability to monitor the internal parts of the new system is one of its advantages. This monitoring can be performed via monitoring points located at the points on the external part with the lowest stress and strain. The gap in the middle part will provide the required space for monitoring and maintenance purposes. This is especially critical for the strengthening of existing structures because in most usual retrofitting cases, the existing elements are covered with new materials in such a way that there is no possibility for monitoring the internal parts.

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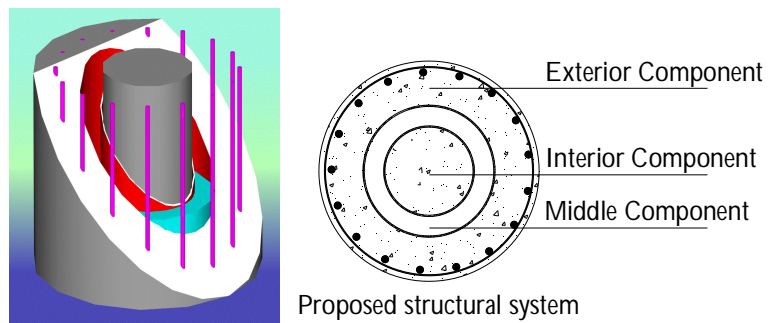
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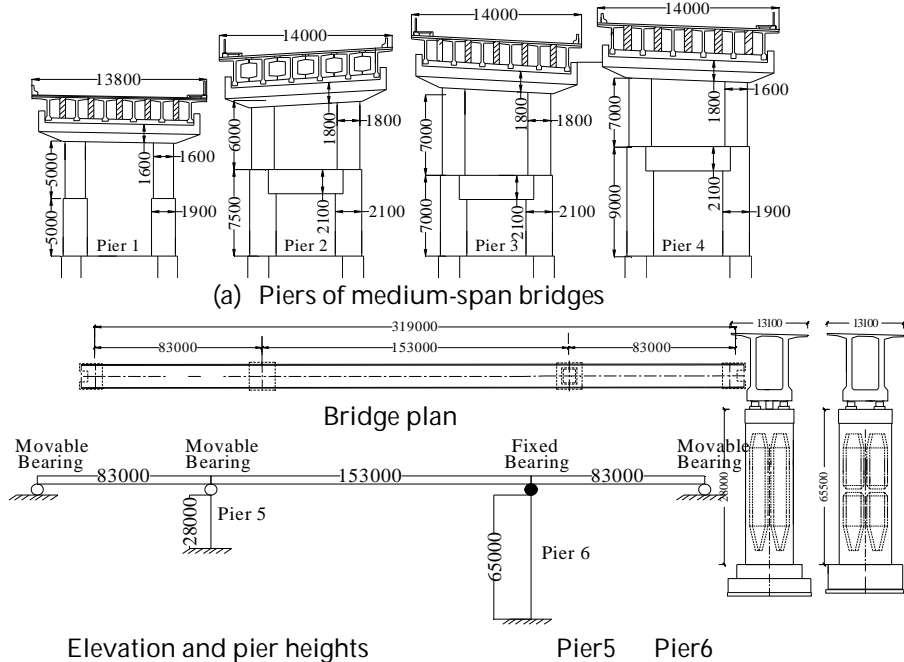
**Fig1. General view of the new and conventional system.**





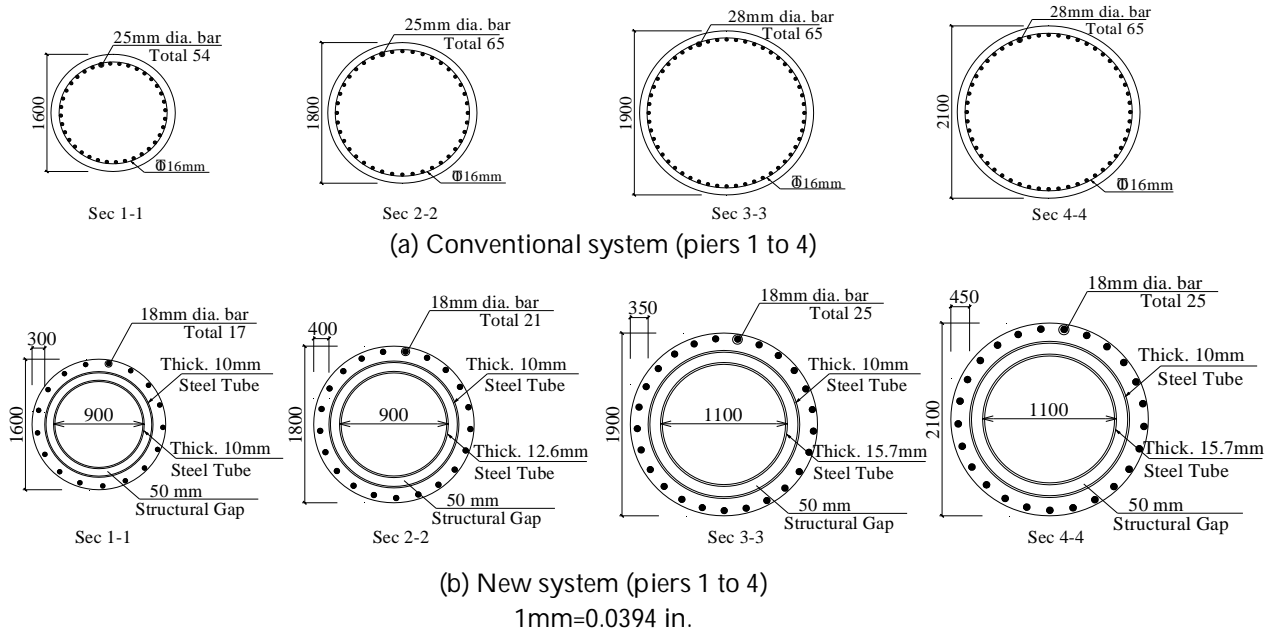


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(b) Structure plan, elevation, and section of the BR-05 Bridge 1mm=0.0394 in.

**Fig2. Geometry of the bridges.**



**Fig. 3–Cross section of the piers for medium-span bridges.**





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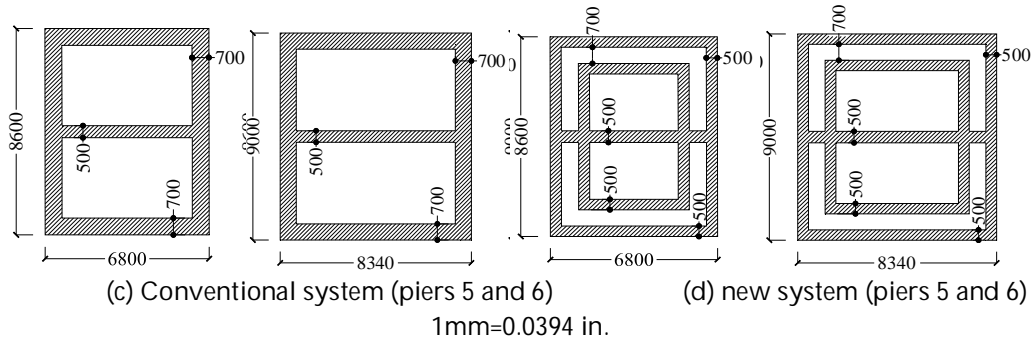


Fig. 4–Cross section of the piers for long-span Bridge.

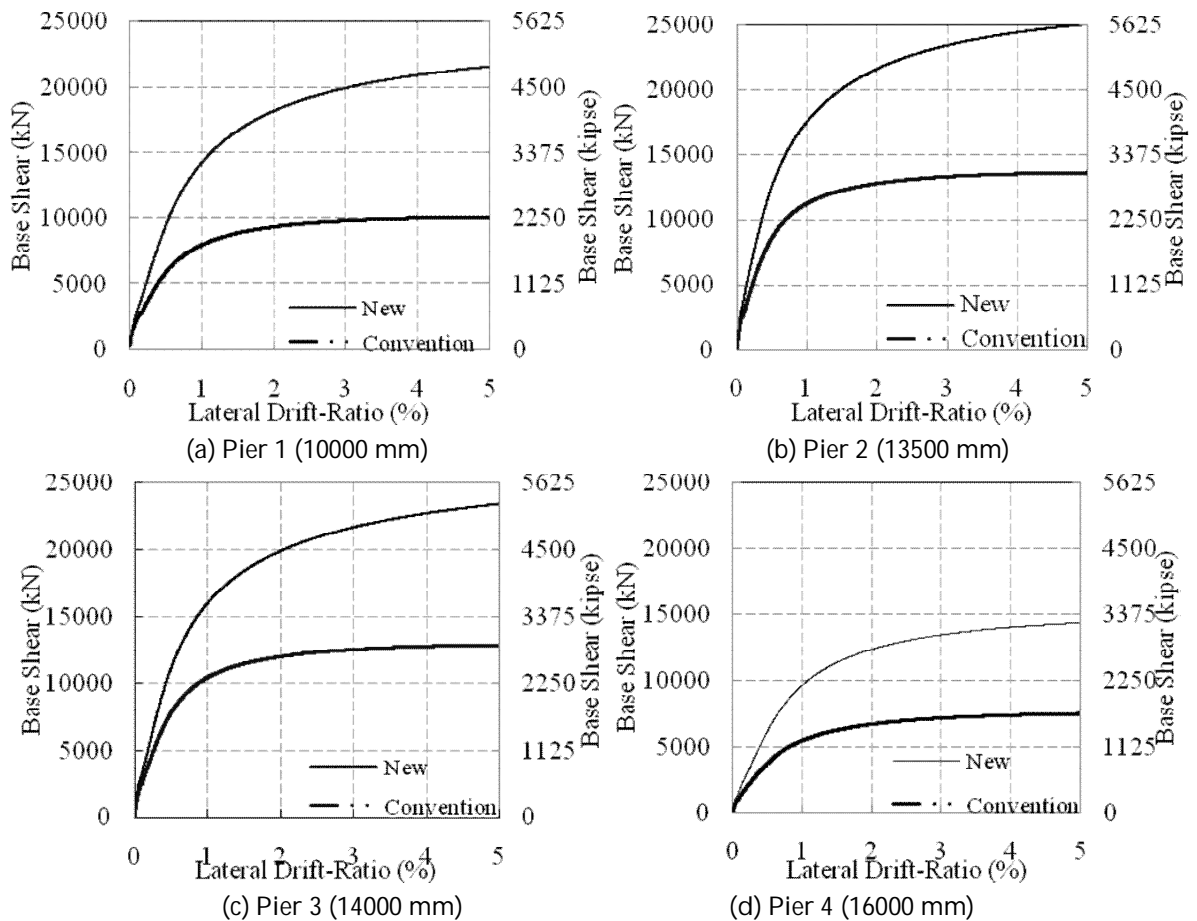


Fig. 5–Pushover Analyses result.





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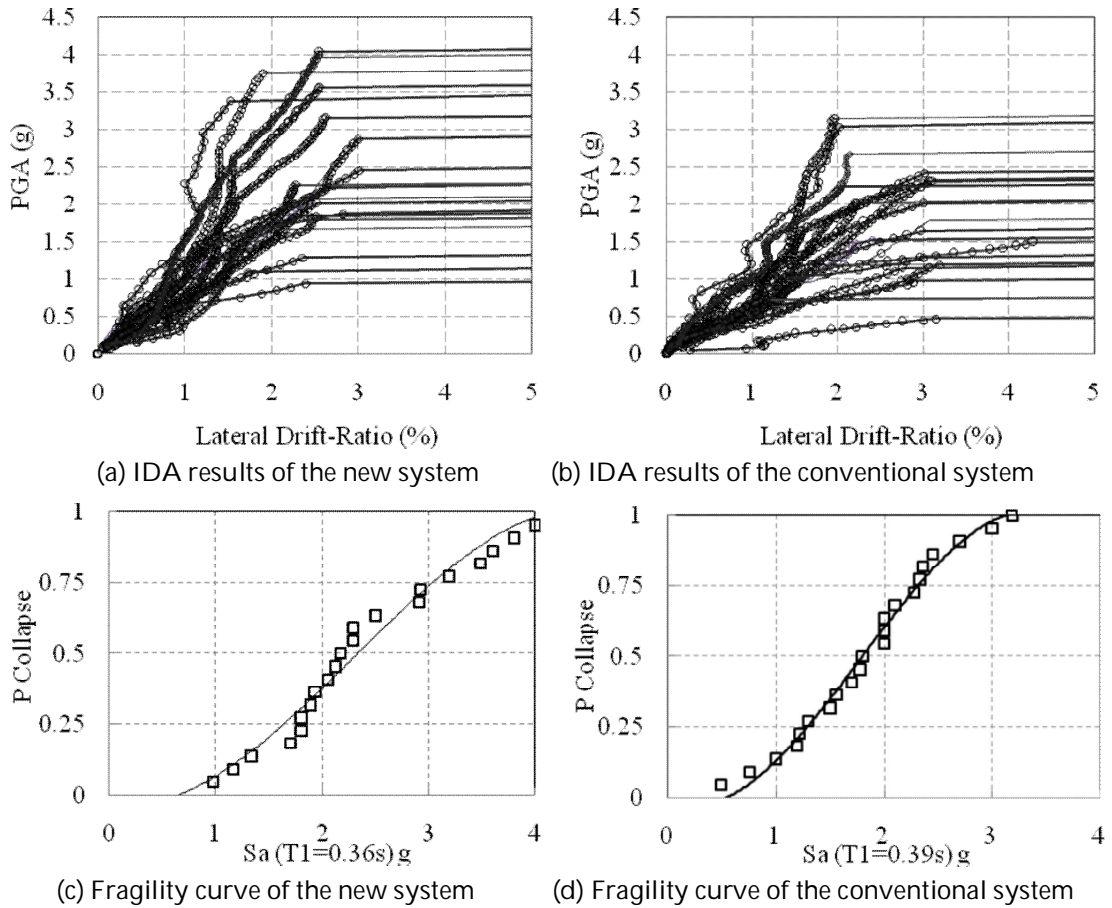
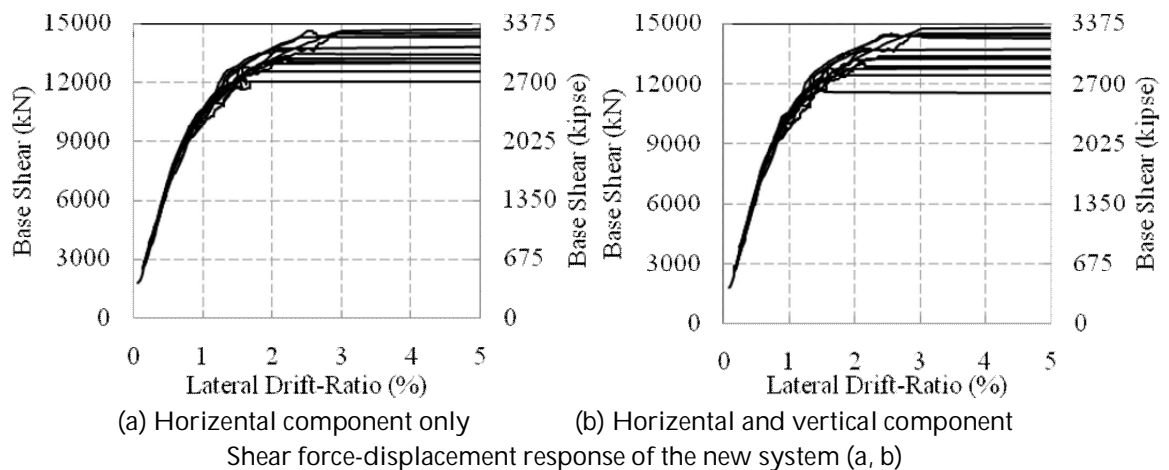


Fig. 6–Results of incremental dynamic analyses and fragility curves for pier 4 (16000 mm).





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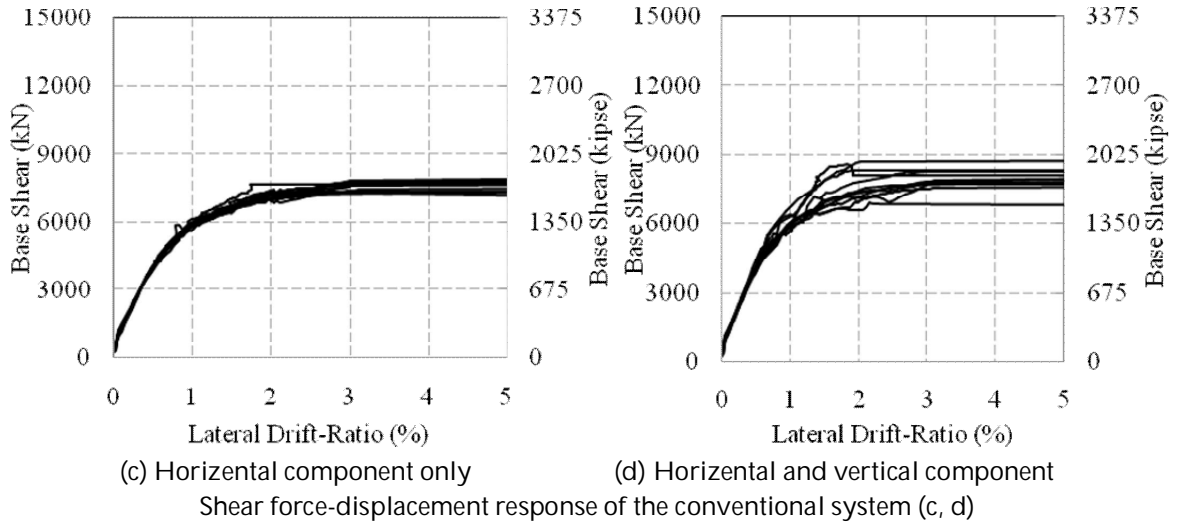
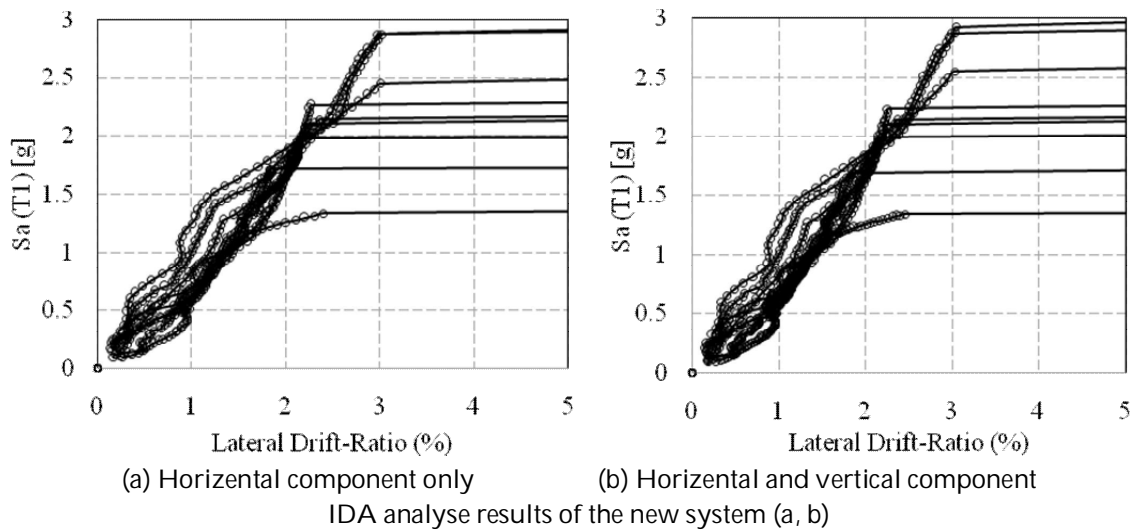


Fig. 7–Dynamic response of the pier 4 (16000 mm pier height).





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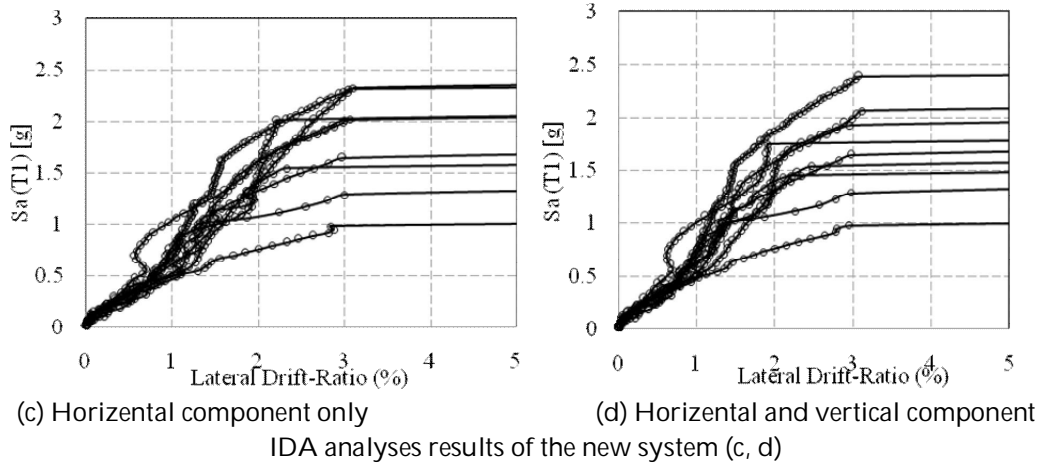
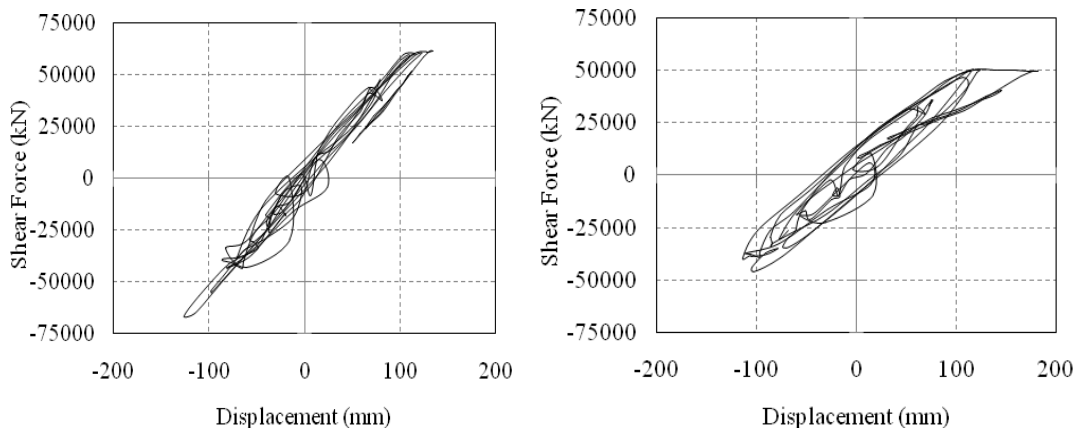
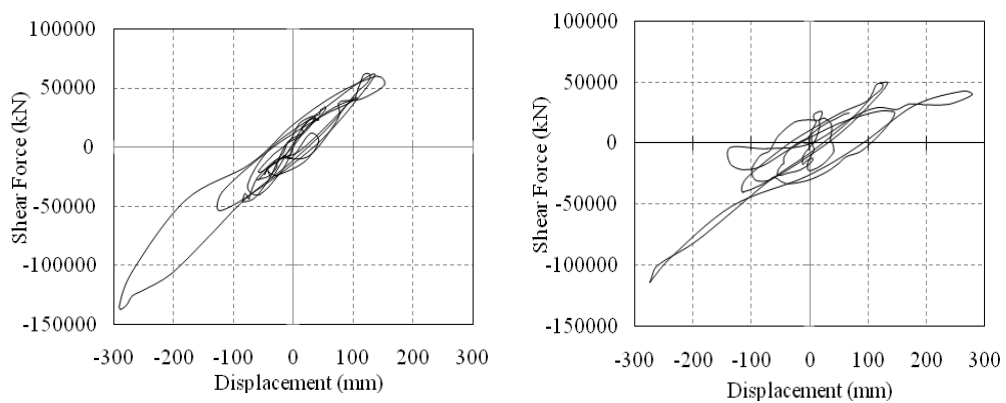


Fig. 8–IDA analyses results of the pier 4 (16000 mm pier height).



(a) Response of the new system for El Centro      (b) Response of the conventional system for El Centro

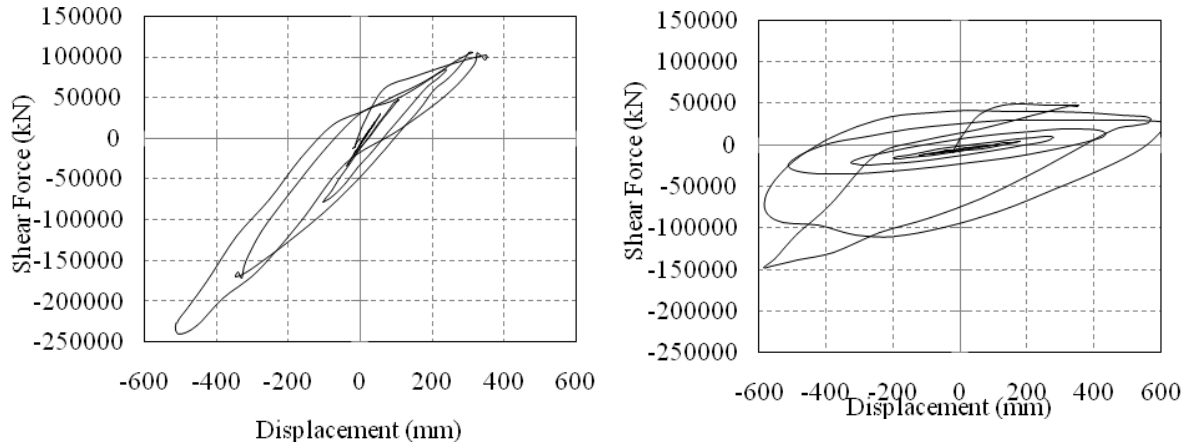


(c) Response of the new system for Kobe      (d) Response of the conventional system for Kobe





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(e) Response of the new system for Northridge (f) Response of the conventional system for Northridge  
 1 kN = 0.225 kips; 1 mm = 0.0394 in.

**Fig. 9–Hysteretic response of pier 6, BR-05 Bridge.**

**Table 1–Results of the collapse performance assessment**

| Case ID | Pier Height, in. (mm) | Structural System | Over-Strength Factor | Fundamental Period, sec | Median Collapse Capacity | Ground Motion Intensity, g | Collapse Margin Ratio |
|---------|-----------------------|-------------------|----------------------|-------------------------|--------------------------|----------------------------|-----------------------|
| Pier-1  | 393.70 (10000)        | New               | 4.02                 | 0.24                    | 2.61                     | 1.09                       | 2.39                  |
|         |                       | Convention        | 2.02                 | 0.27                    | 1.65                     | 1.01                       | 1.63                  |
| Pier-2  | 531.49 (13500)        | New               | 4.12                 | 0.24                    | 2.69                     | 1.09                       | 2.47                  |
|         |                       | Convention        | 2.55                 | 0.25                    | 1.97                     | 1.06                       | 1.86                  |
| Pier-3  | 551.18 (14000)        | New               | 4.27                 | 0.26                    | 2.59                     | 1.03                       | 2.51                  |
|         |                       | Convention        | 2.59                 | 0.27                    | 2.41                     | 1.01                       | 2.39                  |
| Pier-4  | 629.92 (16000)        | New               | 3.18                 | 0.36                    | 2.31                     | 0.83                       | 2.78                  |
|         |                       | Convention        | 1.88                 | 0.39                    | 1.79                     | 0.79                       | 2.27                  |

**Table 2–Ground motion characteristics**

| Record                      | PGA (g) Up | PGA (g) Longitudinal | PGA (g) Transversal | Date       | Magnitude |
|-----------------------------|------------|----------------------|---------------------|------------|-----------|
| Kobe                        | 0.343      | 0.821                | 0.599               | 1995/01/16 | M (6.9)   |
| Imperial Valley (El Centro) | 0.425      | 0.775                | 0.588               | 1979/10/15 | M (6.5)   |
| Northridge                  | 0.535      | 0.843                | 0.604               | 1994/01/17 | M (6.7)   |





## A Survey of Control of Doubly Fed Induction Machine Drives in Electric Cars

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Received: 23 Mar 2015

Revised: 27 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

The control of Doubly Fed Induction Machine Drives is much complex than standard induction machines and rotor is controlled by electronic converter. Doubly Fed Induction Machine Drives is sensitive to machine terminal voltage loss. One of the important issues in this field is selection of a good controller for convertors. To do this, a direct vector controller and Vector proportional integrated are used to control DFIM-based electric car. Based on different applications of DFIM, a test grid is considered and the effect of this machine on it is evaluated. The results showed that if DFIM is used in electric car, converter power rate is decreased considerably and the engine is working at optimal speed. This selection causes that besides system stability, its total costs are reduced.

**Key words:** Induction machine, Electric cars, DFIM, Vector control, Converter power

### INTRODUCTION

Doubly Fed Induction Machine (DFIM) has great advantages compared to other machines. DFIM is sensitive to voltages loss of machine terminal as deep voltage loss causes induction of great back EMF voltages in rotor and this leads to strong transient currents from rotor and increasing dc in power electronic converter and damage of power electronic converter. One of the important issues is selection of controller for convertors. The analysis of DFIM in an electric car in steady state and transient states is one of the main issues in induction machines. These machines have high output compared to other electric machines. One of the problems of these machines is the investigation of their useful performance in case of fault. The control of DFIM is much complex than standard induction machines. To control DFIM, rotor is controlled by electronic converter. One of the rotor control methods is using field-oriented or vector-oriented control. One of the common methods of rotor flux control is stator flux orientation (Dufour, Bélanger,





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2004; Song et al., 2005; Munoz-Aguilar, 2009; Dehkordi, 2009) To control the machine, scalar-control is used. This method is suitable from cost issues but is not applied for wide range of speed variations. The reason of inefficiency of this method is dependence of torque and flux to machine currents. Because control of these two parameters as independent is not possible and the change of each of them is effective on another one. Vector control is as three-phase model is converted to two crossing coils and it is attempted to control the current of these two coils. For example, induction machine is considered with three coils. In this project, by direct control method, DFIM electric cars are controlled under voltage reduction conditions (fault) of grid (system). These machines have high output compared to other electric cars. One of the problems of these machines is the investigation of their useful performance under fault conditions (Babouri et al., 2013). As it was said, a deep modeling is the requirement of using these cars. To investigate DFIM during transient performance, both control and modeling are of great importance (Drid et al., 2008). The present study evaluates DFIM control methods. To do this, a direct vector controller and Vector proportional integrated are used to control DFIM-based electric car.

**Introduction of DFIM system and test network**

Equivalent circuit of DFIM system includes a DFIM and a back-to-back voltage source converter with DC link. Back to back converter consists of a machine-side converter (MSC) and a grid-side converter (GSC). A grid filter is located between GSC and grid as both grid and source have fixed voltage and generated harmonics should be reduced due to converter (Babouri et al., 2013). For voltage source converters, grid filters are used, mostly it is a L filter with LCL filter. In this project, filter L is used (Figure 1).

Due to simplicity of drive control rules of DFIM,  $\Gamma$  of induction machine model is used. It is named because of "Γ" shape of inductances. From dynamic aspects, leakage inductance of stator and rotor has similar effects. Thus, we can use a different view of Park model in which induction inductance is placed in rotor model and it is called  $\Gamma$  view of induction machine (Bekakra, Attous, 2010). This model is described with the equations as followings. Equations 1, 2 are in stator coordinate. The model in synchronized coordinate is expressed as equations 3,4.

$$V_s^s = R_s i_s^s + \frac{d\Psi_s^s}{dt} \quad (1)$$

$$V_R^s = R_R i_R^s + \frac{d\Psi_R^s}{dt} + j\omega_r \Psi_R^s \quad (2)$$

$$V_s = R_s i_s + \frac{d\Psi_s}{dt} + j\omega_1 \Psi_s \quad (3)$$

$$V_R = R_R i_R + \frac{d\Psi_R}{dt} + j\omega_2 \Psi_R \quad (4)$$

To investigate the performance of grid with DFIM, test grid in Figure 3 is shown.

To analyze test grid, PAST Toolbox of Matlab software is applied as analyzing power systems, fact tools in most states as fault. In this toolbox, steady state and transient are investigated. Grid lines voltage (after trances of machines) is 230 KV and in Tables 1, 2, the features of trances and loads of grid are shown ((Babouri et al., 2013); Johnsson, 1985; Behnia et al., 2014)







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Instantaneous apparent power in stator terminals,  $S_s = P_s + jQ_s$  is equal to:

$$S_s = 3V_s i_s^* = 3 \left( R_s i_s + \frac{d\psi_s}{dt} + j\omega_1 \Psi_s \right) i_s^* \quad (5)$$

Thus, active and reactive power ignoring stator flux is written as:

$$P_s = 3R_s |i_s|^2 + 3\omega_1 (\psi_{sd} i_{sq} - \psi_{sq} i_{sd}) \quad (6)$$

$$Q_s = 3\omega_1 (\psi_{sd} i_{sd} + \psi_{sq} i_{sq}) \quad (7)$$

Voltage of each of buses is equal to series voltage of trans as connected to it. Figures 4, 5 show the voltages of buses of required grid. As shown in Figure 4, this grid is stable for initial conditions.

If on one of the buses of grid (bus 7), a fault is occurred for 0.2s, voltage of buses of grid is shown as Figures 6, 7. Figure 6 shows that if for fault 0.2s and low values, the grid has considerable changes, this fault doesn't lead to grid instability. The fluctuations can be compensated and if they are few, there is no specific problem (Babouri et al., 2013); Hoffmann 2002).

In Figure 7, the voltage of some of buses of grid is reduced compared to non-fault state but it doesn't reach very low and zero. The better comparison of voltage of grid buses for fault 0.25s is shown in Figures 8,9. Figure 8 shows that for such fault and faults with much time, the grid is instable as voltage of some of buses of grid is zero and it makes problem in system.

## FINDINGS

### Test grid in DFIM

The grids based on DFIM show different behaviors compared to other grids but their underlying equations and evaluation of performance of these grids is similar to other systems. Figure 10 shows the required grid in the presence of DFIM (Behnia et al., 2014).

Figures 11, 12 show the voltage of buses of grid in this stage. In this stage, the grid is not instable but it has high distance from common state. Thus, in case of adding DFIM to grid, reliability of grid (or other tool) is increased but its stability is reduced (Behnia et al., 2014).

### Direct vector controller method

The basis of vector control is based on converting three-phase to two-phase model. To select flux to direction, there are many methods as Stator Flux Oriented, Rotor Flux Oriented and Magnetizing Flux Oriented. Rotor flux orientation method is preferred compared to other methods.

By defining fluxes of d,q axes of rotor, rotor flux angle is obtained based on following equation. Based on this angle, stator currents is written in synchronize device, rotor torque is computed as equation 9 and torque equation is shown in equation 10.





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$$\theta_e = \tan^{-1} \left( \frac{\lambda_{qr}^s}{\lambda_{dr}^s} \right) \tag{9}$$

$$T_r = \frac{L_r}{R_r} \text{ Rotor time constant} \tag{10}$$

$$T_e = \frac{3 P L_m}{2 L_r} \lambda_{dr}^e i_{qs}^e \tag{11}$$

Based on above equation in case of constant flux, the torque is controlled by  $i_{qs}$  current as independent. Figure 13 shows the changes of torque based on rotor inductance changes (Chen et al., 2010).

**Vector proportional integrated (VPI)**

To control DFIM in electric car, VPI is used. VPI acts as with absolute stability, there is no extra imposed load in terms of instability to system under any conditions and by phase of 90 degree in all stages and for various values, in disturbance state, stability voltage is improved considerably.

The equation of VPI controller generally is in equation 12.

$$C_{VPI} = K_p + \frac{K_i}{s} + \frac{K_{pr}s^2 + K_{ir}s}{s^2 + \omega_c s + \omega_0^2} \tag{12}$$

Thus, the function converting this regulator includes three zero and three poles. Figure 15 shows diagram block of VPI controller.

Existing coefficients in diagram block for values  $k_{pr} = 1, k_{ir} = 157, k_f = 1, k_i = 1, \omega_c = 10, \omega_0 = 100\pi$  are computed for VPI controller. The geometry location chart of open loop of VPI controller is shown in Figure 16. In open loop, this controller is stable as all geometry places are in the left side  $j\omega$ .

Figure 17 shows that close loop function of VPI controller is stable for all various frequencies and corresponding poles. For example, if this controller is used in system of Figure 10, the results of voltages are as Figures 18, 19. As shown in these figures, VPI controller can mostly improve grid stability and be resistant against other changes.

**CONCLUSION**

This study evaluates the control methods of DFIM in electric cars. Some new control methods are analyzed to improve the performance of operation of DFIM as vector-oriented, direct power control and current control. Two control methods are approved, vector-oriented control and direct power control in DFIM-based system. DFIM is sensitive to machine terminal voltage drop. One of the important issues in this regard is selection of a good controller for convertors. To do this, a vector controller (direct and proportional) is used to control electronic car based on



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DFIM. By adding DFIM, grid stability is reduced. Thus, using vector controller improves grid stability considerably as disturbances of grid voltages are compensated mostly. Vector proportional controller acts as besides not imposing extra load in terms of instability by absolute stability, by phase limit 90degree, in all states and for various values for coefficients, in disturbance of stability voltage can be improved mostly. If DFIM is used in electric car, converter power rate is decreased mostly and it causes the engine works at optimal speed. This selection causes that besides system stability, total cost is reduced. Vector control method converts three-phase model to two crossing coils and by control by this method, torque is dependent upon rotor inductance, magnetizing inductance and existing fluxes.

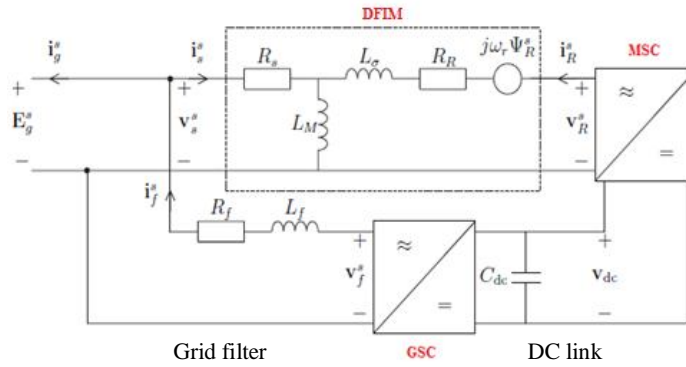
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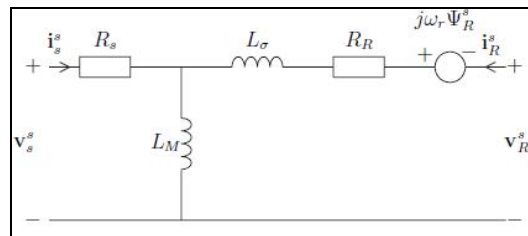




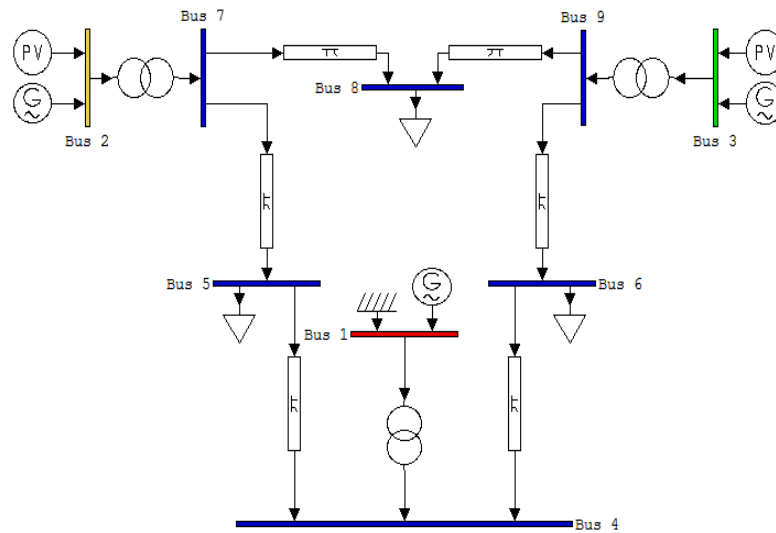
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**Figure 1- Equivalent circuit view of a DFIM system**



**Figure 2- \$\Gamma\$ induction machine in stator coordinate**

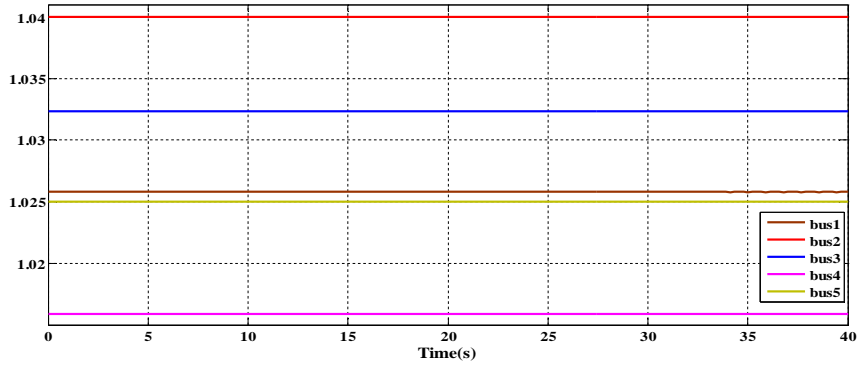


**Figure 3- Investigated test grid**

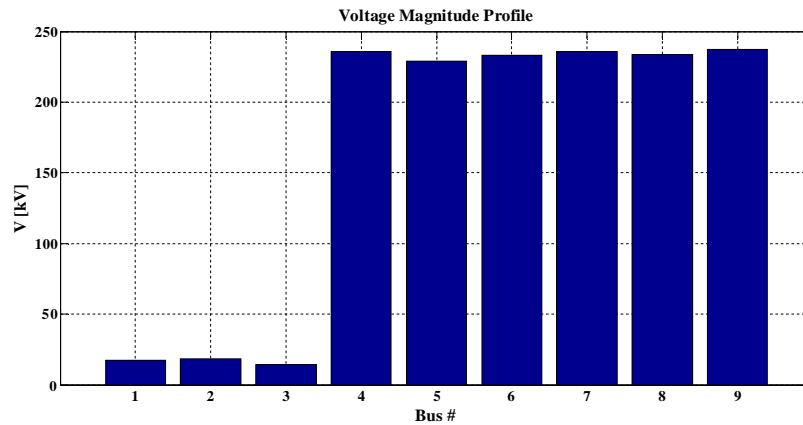




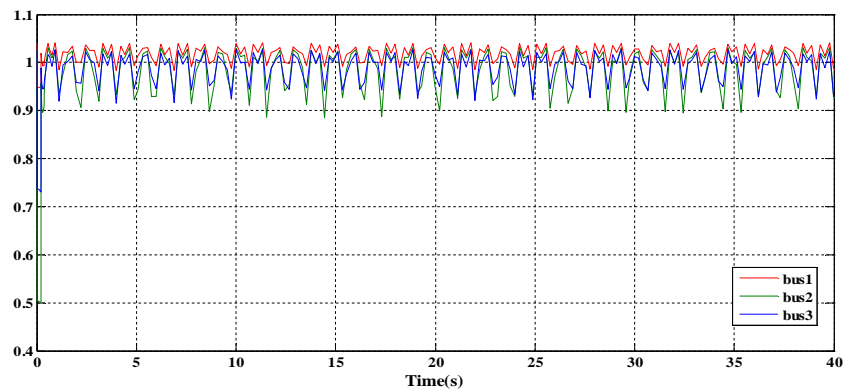
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**Figure 4- Voltage of some of buses of required grid**



**Figure 5- Voltage of buses of non-fault grid**

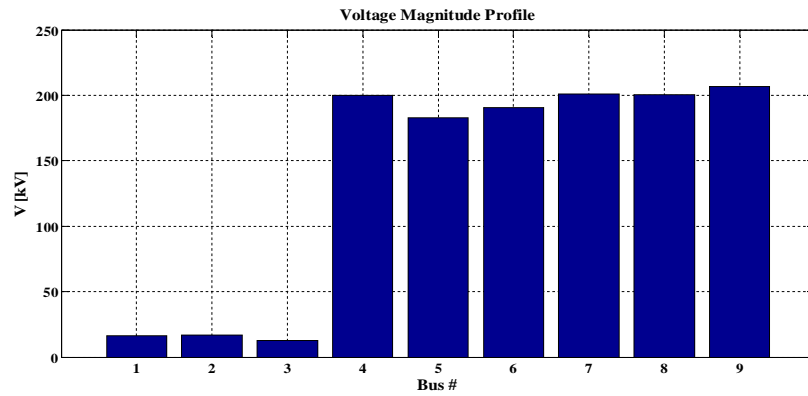


**Figure 6- Voltages of some of buses of grid in fault 0.2s**

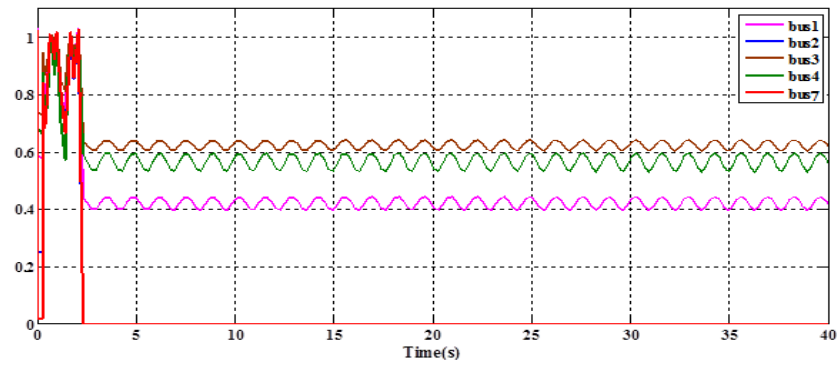




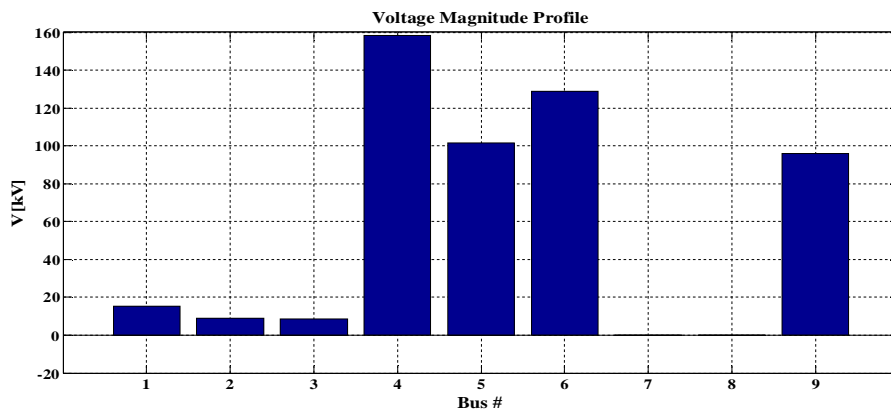
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**Figure 7- Voltages of buses of grid in fault 0.2s**



**Figure 8-Voltages of some of buses of grid at fault 0.25s**

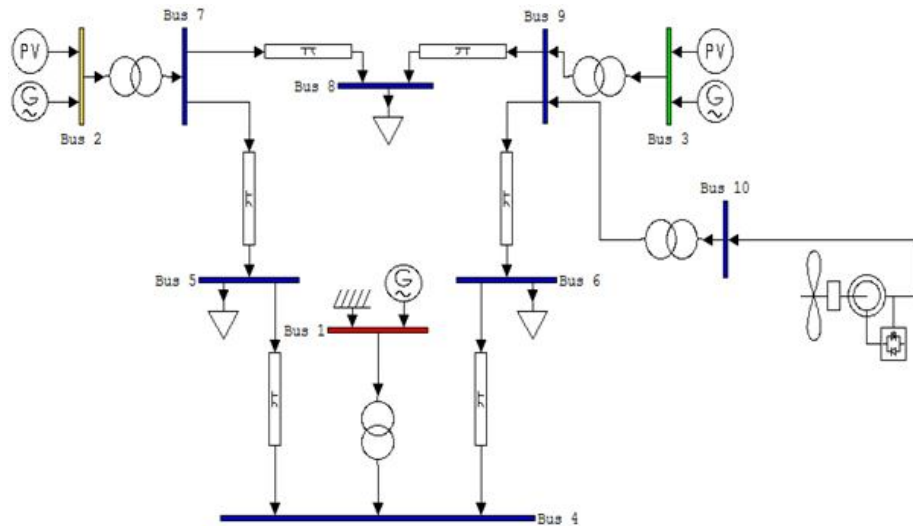


**Figure 9-Voltage of buses of grid at fault 0. 25s**

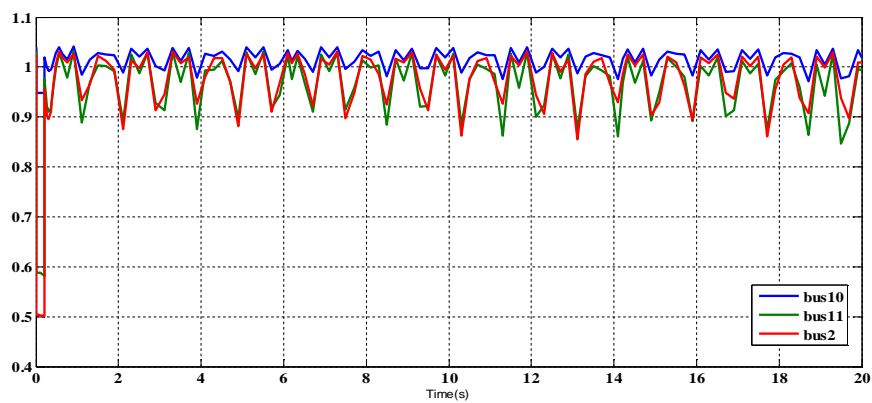




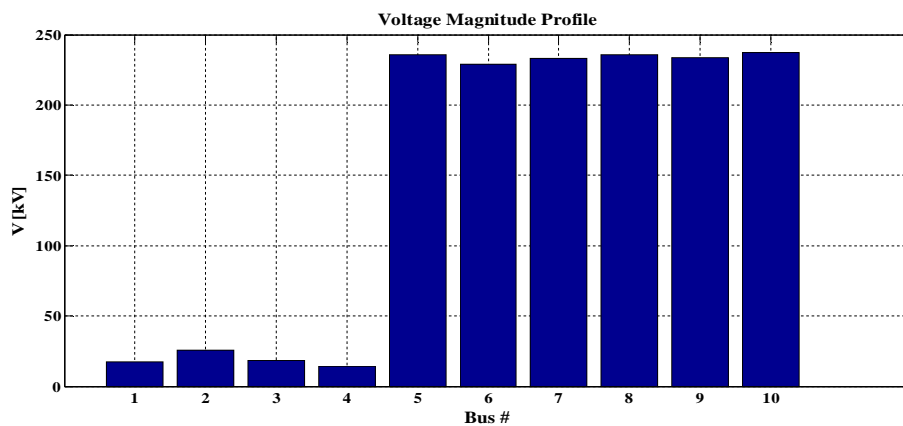
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**Figure 10- The investigated grid in the presence of DFIM**



**Figure 11- Voltage of some of investigated grid buses with DFIM**



**Figure 12- Voltage of buses of grid in DFIM presence**





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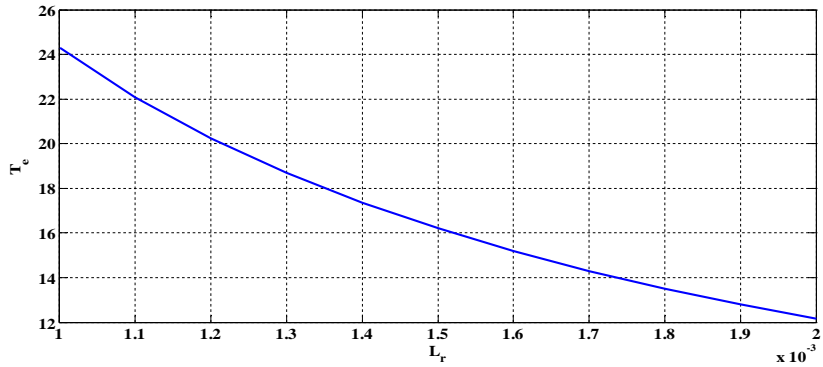


Figure 13-The torque changes based on rotor inductance changes

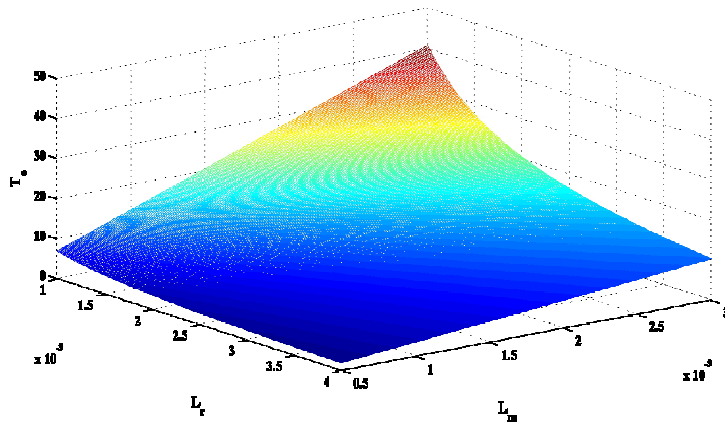


Figure 14-Torque changes based on simultaneous changes of rotor and Magnetizing inductances

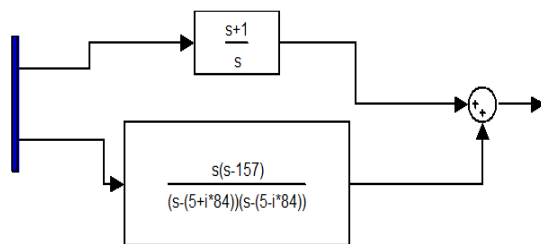


Figure 15- Block of VPI controller diagram

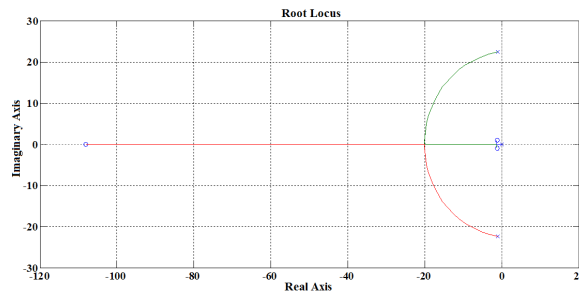


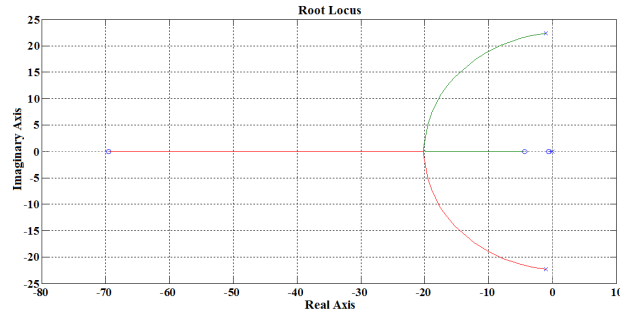
Figure 16- The geometry location of open loop of VPI controller poles



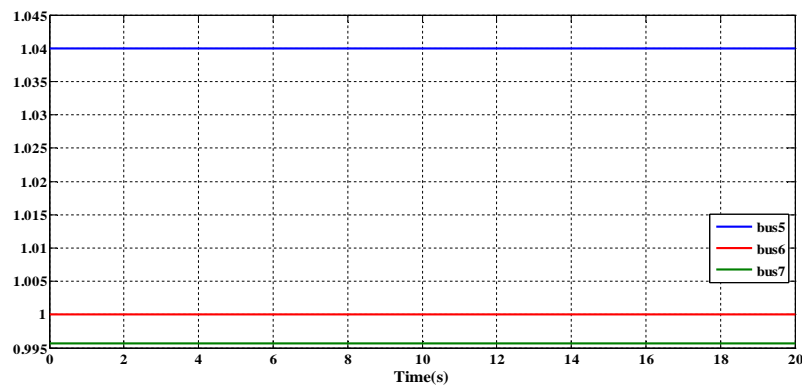




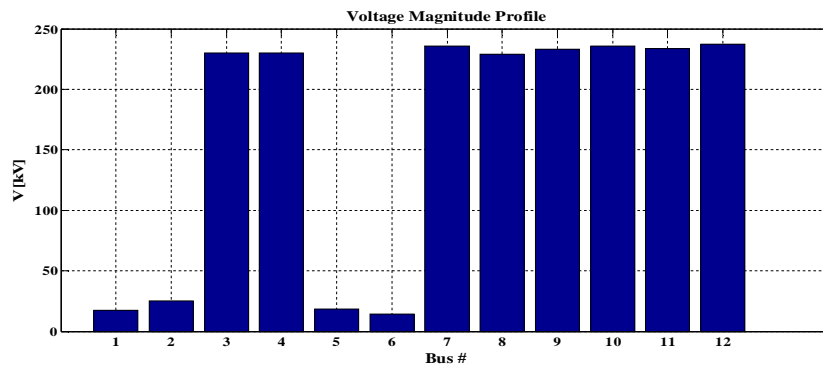
**Shima Saeidy Dizajy and Daryoosh Nazarpour**



**Figure 17- The geometry place of close loop of VPI controller poles**



**Figure 18-Voltage of some of buses of grid in the presence of DFIM and VPI controller**



**Figure 19- Voltage of buses of grid in the presence of DFIM and VPI controller**





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**Table 1- Features of trances of studied grid**

| Voltage ratio | Reactance (p.u) | Resistance (p.u) | Trans number       |
|---------------|-----------------|------------------|--------------------|
| 16.5/230      | 0.0576          | 0                | Connected to bus1  |
| 18/230        | 0.0625          | 0                | Connected to bus 2 |
| 13.8/230      | 0.0586          | 0                | Connected to bus 3 |

**Table 2- Features of investigated grid loads**

| Reactive power ratio | Active power ratio | (MVA) load | Bus Number of load |
|----------------------|--------------------|------------|--------------------|
| 0.5                  | 1.25               | 100        | 5                  |
| 0.3                  | 0.9                | 100        | 6                  |
| 0.35                 | 1.00               | 100        | 8                  |





## The Effectiveness of Speed Reading Training on the Reading Speed and Learning Quality [Comprehension] in High School Students

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Received: 23 Mar 2015

Revised: 26 Apr 2015

Accepted: 27 May 2015

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### ABSTRACT

The purpose of this study was to Effectiveness of teaching fast reading on the speed and comprehension. The method of this study is Causal comparison. The population is of all high school Rafat Tehran students (in the academic year 1394-1393), of which, 90 students to aim group (45 cases experimental group - 45 cases in the control group) Sampling method were selected purposely. Speed Reading training package was used for data collection. And to analyze the data, in the description of the average, standard deviation and Charts, And in analytical, according to the purpose and hypothesis of the study was the analysis of covariance. The results showed that training Speed Reading, Effectiveness On speed and comprehension learning.

**Key words:** speed Reading, speed of learning, comprehension.

### INTRODUCTION

Since the beginning of life, human is faced with the problem of learning. Learning is one of the fundamental objectives of education. Providing educational materials to increase the learning and retention has always been one of the key issues in education. Increasing progress of science and the significant spread of information has caused that the problem become more prominently visible so that required factor for effective learning is using as an approach that help more in comprehensive long-term maintenance of the knowledge. The efforts of psychologists and



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education specialists is focused on the way that helps to understand how learning takes place and what steps should be taken to accelerate and improve it (Mostafavi, 2008). Learning changes life and is an attempt to adapt with it (Saif, 2012). Learning is relatively stable potential change in behavior via experience and it can not attribute to a temporary state of health as a result of illness, fatigue or drugs. The study of learning methods can be considered as a technical skill and despite all the advances in technology, still learning through the study and reading are the most common means and a very important part of our learning comes through reading books. Reading is always associated with all mental activities. Reading with more associated mental activity will have better results (Saif, 2011). Reading skills is essential in today's world. In a few generations ago, people without reading power did their job well but today it seems difficult. Man of the twentieth century is inevitable that to take advantages of the experiences of others in the shortest time to live consciously and pave the way of their progress and obtain what -that after a few years of experience may obtain gradually- through reading in a short time(Pournikbakhti, 2007).

The meaning of study was the comprehension of what is written and read and the understanding and knowledge of the values and concepts of words and phrases and the meaning and purpose of the message of the author. It should be noted that the reading speed is variable in respect to reading comprehension and the topics. Excellent reading requires skills beyond the apparent meaning. But how can we reach this level of proficiency in reading? What steps should the learner take to achieve these skills during work? How can we improve learning and remind them? This is a question that has occupied the minds of researchers. One of the major obstacles in the way of development and progress of the study is the lack of the reading that due to the lack of information provided based on the proper method of study and speed reading (Miller, 1968, translated Talebizade, 1989 quoted Saif al 2008). A survey of studies shows that many researches is performed about the speed reading and its education. For example the result of Simon study (1995) show that speed reading is only effective on reading speed and has not any effect on comprehension and learning retention but the results of Kanani (2011) showed that Keller pattern has effect on learning and retention of junior high school English course while the Merrill pattern increase learning training techniques and learning retention by providing cognitive and metacognitive methods, but research on the impact of speed reading training and its impact on reading and learning skills of high school students has not performed yet. Lack of research in this area motivated us to examine the aspects of different methods of speed reading techniques and their positive impact on all aspects of learning and study (Shajari, 2008). The motivation of this study was to evaluate the effect of speed reading on learning and the rate of learning and comprehension in students. With no doubt, achieving this goal will determine the scale of the different aspects of speed reading and in this regard, it will be added to our knowledge as a fundamental objective but the purpose of this study is not limited to the fundamental objective but all those involved in education can use it scientifically. This means that the knowledge of how this research can be helpful and scientifically useful beginning for all those who are seeking to investigate the speed reading and try to discover the causes of this phenomenon. According to mentioned reasons, the researchers sought to answer these questions:

- Does speed reading have any effect on speed training in high school students?
- Does Speed Reading Training have any effect on learning [comprehension] in high school students?

**RESEARCH METHODS**

Because this study sought to determine the effect of Speed Reading training (as a predictor variable) on the speed of reading and learning (as a criterion variable), therefore, a semi-experimental research (pre-test and post-test) was used. The study population was all high school students in Rafat high-school (320) in Tehran in the 2014-15 school years. The sample consisted of 90 students who were selected by purposive sampling from the population so that the high school students were randomly selected. To gather information, from the Tehran public schools, one school was randomly selected where 90 students were selected by purposive sampling. They were divided into two





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experimental and control groups (matched by specific age-specific IQ - and the similar school records). In both groups, at the beginning a text that was unfamiliar, but was in accordance with their reading ability was given them to study and after study, text comprehension rate was estimated. The following statistical methods were used in this study. In the description part, the mean, standard deviation and charts are used while in deduction part the analysis of covariance is applied with regard to the purpose and premise of the study.

## RESEARCH FINDINGS

Table 1: the mean and standard deviation of the pre-test and post-test speed study in both groups (n=90)

Based on the above table, the speed of the "experimental group" in the "post-test" increase compared to "pre-test", while in the "control group", these changes are very low. These results can be deduced from the following chart:

### Learning quality (comprehension)

As seen in the above table, the average "comprehension" in students who learnt Speed Reading has increased (experimental group), but the score of "pre" and "post-test" in control group is almost identical. These results are also shown in the following diagram:

### Research hypotheses

First hypothesis: Speed Reading training has effect on high school reading speed.

The first hypothesis was tested by analysis of covariance, but before the test, the test presuppositions are examined:

### Evaluation of homogeneity of regression

The calculation of the assumption showed that obtained F was not significant ( $p=0.06$ ,  $df=1.86$   $F=3.7$ ); therefore assumed homogeneity of regression coefficients in both groups will be accepted.

The evaluation of the presence of a linear relationship between the random and dependent variable

The scatter plot were used to determine above assumptions

With respect to the non-intersection of regression lines, linear relation between variables and the dependent variable can be accepted.

### Homogeneity of variances

Levine test confidence level shows that homogeneity of variance in speed study variable has not violated.

Based on the table above and the control of the effect of pre-test, F was significant at 0.01 level ( $p=0.01$ ,  $F(1,87)=37.06$ ); In other words, there is significant difference between the experimental and control groups. As seen in Table 1-4, the "speed study" in the experimental group after the intervention increased while the score changes is not significant in the control group; therefore the null hypothesis can be rejected at 0.01 level and with the 99 % confidence, it can be stated that speed reading teaching increased the reading speed in students. The effect measure



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also shows that about 37.7 percent of reading increase can be explained through the assignment of control and experimental groups. These results can be seen in a line chart below:

**The second hypothesis Speed Reading Training has effect on Learning [comprehension] of high school students**

The second hypothesis was tested using a statistical model covariance, but the use of this test requires following presuppositions:

Evaluation of homogeneity of regression

F test significance level was not significant in covariance  $\times$  ( $p=0.09$ ,  $df=1.86$ ,  $F=3$ ), so we can say that the assumption of homogeneity of regression coefficients in the comprehension variable is established.

**The presence of a linear relationship between the random and dependent variable**

As can be seen in the scatter plot, the regression line is almost parallel i.e. there is a linear relationship between two variables.

**Homogeneity of variances**

Based on the table above, Levine F test is not significant, i.e. the variance in the dependent variable in the same group.

The results above show that by control of pre-test effect, the significant level of F is less than 0.05 ( $P=0.01$ ,  $F(1, 87)=37.06$ ); in other words, there is significant differences between the post-test of the experimental and control groups in terms of the "comprehension" variable. Comparison of mean of groups in Table 2-4 shows that "learning" in the experimental group significantly increased, while such a change is not observed in the control group. Therefore with 99% of confidence, it can be concluded that "training Speed Reading" enhanced learning (comprehension) in high school students so that approximately 34% of this increase is related to speed reading training.

**CONCLUSION**

After data collection and appropriate statistical methods according to the hypothesis of the study, the results were as follows:

**The main hypothesis:** Speed Reading training has positive effect on learning and comprehension in high school students. The results of the first assumption about "influence of education of speed reading on Reading speed and Learning [comprehension] in students" have shown that the speed reading training is effective on reading and Learning [comprehension] of students. These results are consistent with Tavakoli (2009), Karami (2002), Nagouk yen (2012), and Lio (2012) and approve them. In the explanation of the above hypothesis it can be said in the modern world, unwritten media has increasing growth and TV surpassed printed media in many cases in the world. However, many people have tried to follow things through reading the print media. If they watch an important event in TV, they still eagerly look forward to read things in the newspapers about what they have seen to comply them together (Saif, 2003). In other way, reading skills is essential in today's world. Reading skills is essential in today's world. In a few generations ago, people without reading power did their job well but today it seems difficult. Man of



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the twentieth century is inevitable that to take advantages of the experiences of others in the shortest time to live consciously and pave the way their progress and obtain what that after a few years of experience may obtain gradually through reading (Pornikbakhti, 2007). If the reader knows the mystery of just reading it from the beginning and used to apply Speed Reading as a skill in reading, he will see a group of words in a sentence with a wider field of view and could see and read a sentence or part of a sentence. It should be noted that the reading speed is variable in respect to reading comprehension and the topics. Excellent reading requires skills beyond the apparent meaning. Only in the last few decades, researchers pay attention to speed reading and performed some research about that (Saif, 2003). The need for speed reading was felt first in the United States Air Force, and because of the importance of this issue, psychologists and experts of trained Air Force personnel try to discuss and find a solution to this problem. They invented a device called Takis Toskop that images were shown on the screen at short distances. The first images were shown quite large and slow, but gradually the smaller images and less time. They found that average people after the training images can detect images are displayed only 1/500 seconds (Aarnoutse, 2000). Thus, if the eyes can see these in incredible speeds and brain process, other activities can be performed in such as impressive speed and accuracy. Part of the result of this experience is used in Speed Reading Study Skills. In this way, the word with a large size were shown on the screen for five seconds, and then gradually decreased its size and its the resolution was decreased too, and four words on the screen at the same time rather than one word for 1/500 seconds that makes the brain and the eyes able to understand and see the expressions. With the continuation of this practice, the ability to identify and record the words of the memory increased. Because, due to the wider range of visibility, as a result of this exercise, one can read and understand additional lines simultaneously instead of a word or line. Using this method, the person can study and understand between 1000 and 4000 words in a minute (Rvntr, 2000). Speed knowledge, at present, has attracted attentions in the most advanced societies and the greatest efforts is performed on students in different courses and many of the methods and techniques taught in childhood and adolescents (Saif, 2003). Today, the global community of Speed Reading is estimated more than 8000 words per minute speed, however, based on current statistics and studies, in most normal people the ability to read with understanding is about 100 to 400 words per minute. Consequently, research has found that speed reading training increased reading speed and has effect on Speed learning and comprehension (Saif, 2003).

**The first sub-hypothesis** speed reading training has positive effect on the reading speed of high school students.

The results of the first sub assumption about "influence of speed reading education on Speed Reading" have shown that the students training are effective on their reading speed. This result is consistent with Simon (1374), Karami (2002), Chung (2010), Ikonta (2010) and approved them. To explain the result of the above hypothesis, it can be said to "live in the time" and be in contemporary of his time, Having the knowledge about the world of books and publications although a brief and general is necessary. However, there are limited opportunities, employment and a lot of books and magazines especially the works of its predecessors in various fields. Today, in addition to scientific studies, it does require training and testing different things and information while information was founded on the "modern man", makes the work more difficult. As a result was that the way should be selected in which to a "minimum time" to study "the most books" and the necessary knowledge of the "Speed reading" has created and training centers and institutions engage themselves to train it and different ways is about "speed reading" and some books is written in this field (Saif, 2003). We know that one of the biggest obstacles in the way of progress and growth is the lack of study, including its lack of proper methods and Speed Reading. Due to the fact this question is asked that people how spend time studying science? Research and studies in countries around the world suggests that methods and techniques of Speed Reading has a positive impact on people's reading (Braten, 2004). Our era can be characterized with a lot of attention and interest of reading. Official organizations called "1970" reading decade because despite broadcasting, 7% of the study was performed through reading. On the other hand the importance of study and reading is obvious in the world progressive community. Improvement in the reading speed and comprehension is considered as the important training steps. In these societies, the suitable reading methods are thought to learners in addition of other lessons (Cantu, 2006). Speed reading and its development began in the early twentieth century. Since the mass production of information materials have been reaches to the uncontrollable and



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with the usual speed of the researchers were not able to afford them, It was important to have the abilities to solve more than usual attainment (Saif, 2011). Speed Reading skills could be one of the ways to cover some of these shortcomings. The introduction of these skills and taking an introductory course returns to the years before the First World War. During World War I, the the Air Force experts found that some of the pilots of the aircraft can not see aircrafts fly away this issue was considered a weakness in the critical situations (Graesser, 2007). In addition to mentioned readons, if students are encouraged and pushed to attribute some of their academic failure to unproper use of study methods and at the same time we offer them the correct procedures, they can try hard and take responsibility for the failures of their academic works to be success. One of these methods is speed reading that can be effective in student studye.

**The second hypothesis** :Speed Reading Training has positive impact on Learning [comprehension] in high school students.

The results of the second assumption about the "influence of speed reading education on Learning Speed [comprehension] of students" has shown that speed learning training has positive impact on Learning Speed [comprehension]. This result is consistent with the results of Karami (2002), Tavakoli (2009), Underwood (2012), Liu (2012) and approved them. To explain these results, it can be said reading is the most important learning tool for students. The training of Readers who are active and self-motivated is the main objectives of the training program in elementary school. The basis for reading is comprehension. Comprehension of written educational materials is one of the basic skills of reading that impacts on various aspects of academic achievement. Students with learning disabilities show a lot of problems. Learning comprehension skills are the most important development in the life of a student. Unfortunately, some of the students even though could read the text can not understand it. As a result, effective comprehension training attracted the attention of teachers, researchers and education professionals (Williams, 2009). Comprehension is defined as making a mental representation of the text and its interpretation. In other words, comprehension is the extraction of the meaning from words, sentences and texts. Reading comprehension requires the effective use of the knowledge of the cognitive system. The Graham and Blrt (2004) suggested that one of the main reasons for the problems of comprehension in students with learning disabilities is the lack of appropriate methods of learning. Comprehension strategies are the mental activities that readers select them for the acquisition, organization, development of information and thinking about the content of the text (Bratn, 2004). Also the comprehension strategies and processes are process that is used to understand the meaning of text (Aflerbakh, 2008). Given that Speed Reading is a learning skills, so it can be effective in increasing student comprehension.

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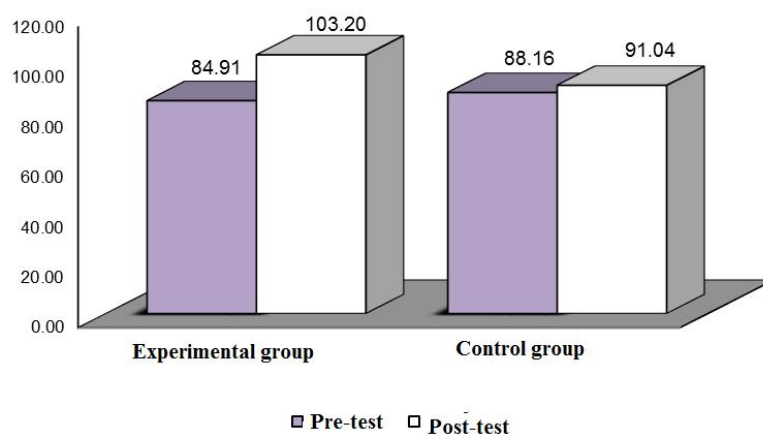






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**Figure 1. Average speed in the pre-test and post-test of the study groups**





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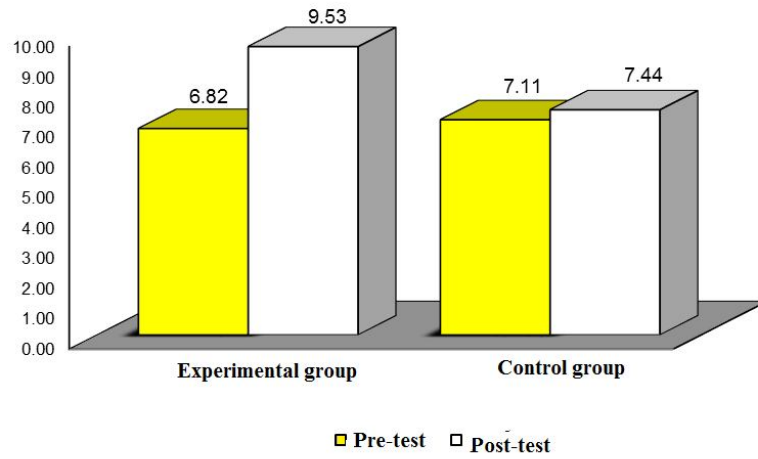


Figure 2 Average comprehension in pre-test and post-test groups

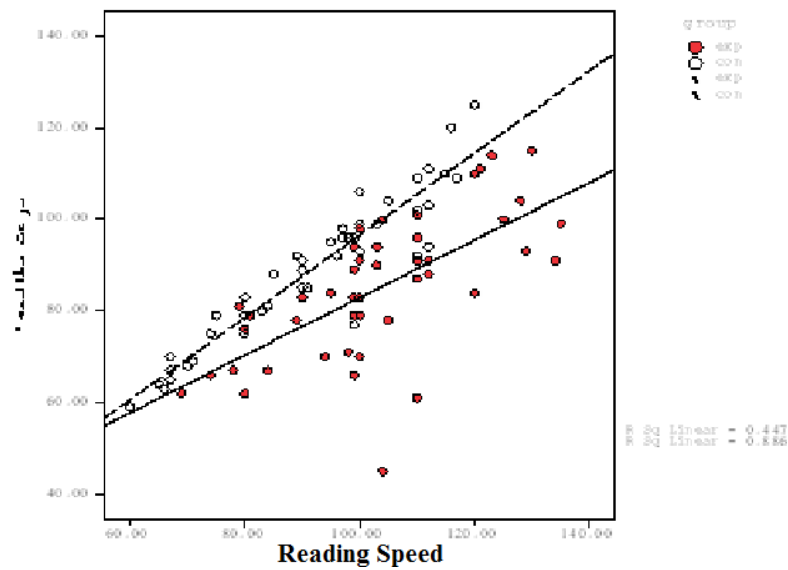
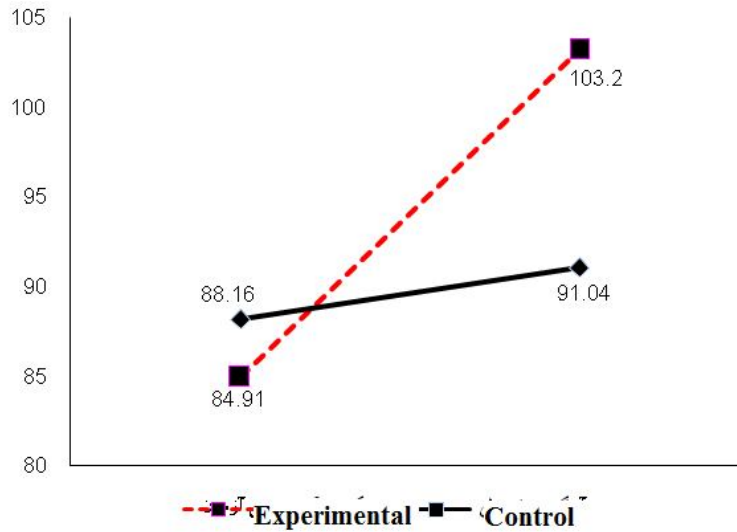


Figure 3: The distribution between the auxiliary variables and the dependent variable in the control and experimental groups in Speed Reading variable

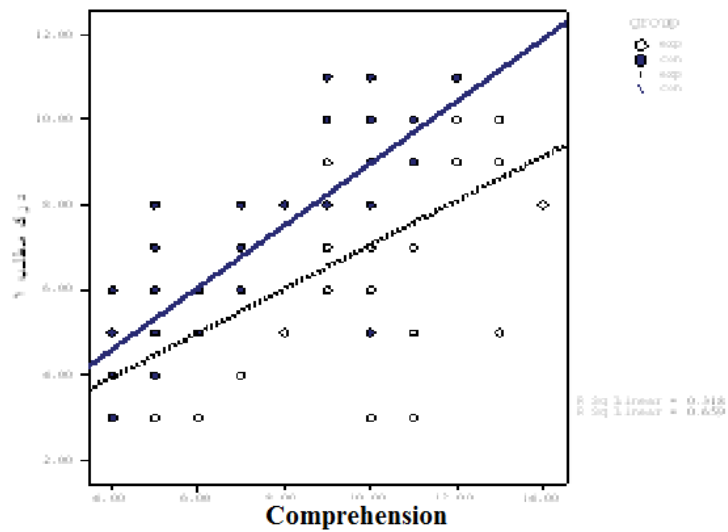




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**Figure 4: The effects of speed reading training on reading speed**

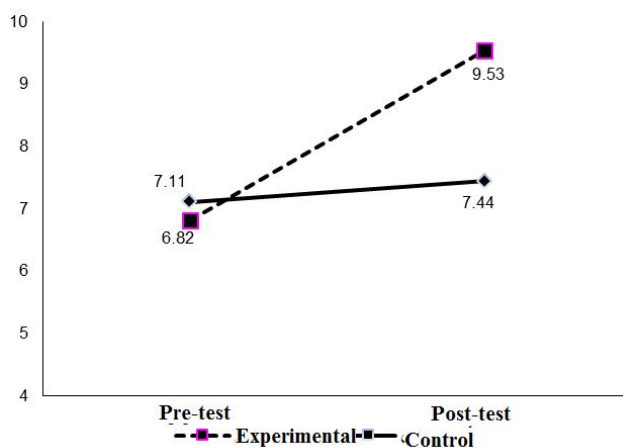


**Figure 5: Distribution of the auxiliary and the dependent variable in the control and experimental group in comprehension variable**





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**Figure 6: Speed Reading effect on the learning quality**

**Table 1: The mean and standard deviation of the pre-test and post-test speed study in both groups (n=90)**

| Variable      | Time      | Experimental (n=45) |           | Control (n=45) |           |
|---------------|-----------|---------------------|-----------|----------------|-----------|
|               |           | <u>M</u>            | <u>SD</u> | <u>M</u>       | <u>SD</u> |
| Reading speed | Pre-test  | 84.91               | 15.5      | 88.16          | 16.5      |
|               | Post-test | 103.20              | 16.5      | 91.04          | 16.8      |

**Table 2: The mean and standard deviation of the pre-test and post-test learning in both groups (n=90)**

| Variable      | Time      | Experimental (n=45) |           | Control (n=45) |           |
|---------------|-----------|---------------------|-----------|----------------|-----------|
|               |           | <u>M</u>            | <u>SD</u> | <u>M</u>       | <u>SD</u> |
| Comprehension | Pre-test  | 6.82                | 2.2       | 7.11           | 2.3       |
|               | Post-test | 9.53                | 2.4       | 7.44           | 2.6       |

**Table 3: Summary of the Levin test to assess homogeneity of variance in speed reading variable**

| F statics | DoF 1 | DoF 2 | Significance level |
|-----------|-------|-------|--------------------|
| 2.5       | 1     | 88    | 0.09               |





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**Table 4: The Ancova test to determine the effect of speed reading education on reading speed**

| The source changes | Total squares | Degree of freedom | Mean square | F ratio | Significance level | Effect Size | Test power |
|--------------------|---------------|-------------------|-------------|---------|--------------------|-------------|------------|
| Covariance         | 15966.2       | 1                 | 15966.2     | 164.2   | 0.01               | 0.654       | 1          |
| Group              | 5113          | 1                 | 5113        | 52.6    | 0.01               | 0.377       | 1          |
| Error              | 8460.9        | 87                | 97.3        |         |                    |             |            |
| Total              | 876697        | 90                |             |         |                    |             |            |

**Table 5: Summary of the Levin test to assess homogeneity of variance in comprehension variable**

| statics F | DoF 1 | DoF 2 | Significance level |
|-----------|-------|-------|--------------------|
| 1.7       | 1     | 88    | 0.2                |

**Table 6: Summary of Ancova test to determine the effect of Speed Reading training on the learning (Comprehension)**

| The source changes | Total squares | Degree of freedom | Mean square | F ratio | Significance level | Effect Size | Test power |
|--------------------|---------------|-------------------|-------------|---------|--------------------|-------------|------------|
| Covariance         | 263.6         | 1                 | 263.6       | 81.7    | 0.01               | 0.484       | 1          |
| Group              | 119.6         | 1                 | 119.6       | 37.06   | 0.01               | 0.299       | 1          |
| Error              | 280.7         | 87                | 3.2         |         |                    |             |            |
| Total              | 7128          | 90                |             |         |                    |             |            |





## Numerical Modeling of Side Weir Built on Natural Channel Bed Erosion on the Hydraulic Performance with Flow 3D Software

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Received: 25 Mar 2015

Revised: 17 Apr 2015

Accepted: 28 May 2015

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### ABSTRACT

To describe the complexity of flows accurately around side spillways, a 3D numerical flow model has been tested. In this study 3D numerical model flow 3d is used to simulate unsteady flows in side spillways in a schematic test channel. Side channel spillways are one of the types of outlet works at dams with wide applications in irrigation, drainage systems, in water and wastewater facilities. Overflow side, known as cross overflow and overflow sections as a free overflow and flow diversion devices are used in hydraulic engineering. They are made in the side channels or rivers to overflow part of discharge's crown at the top of the main level. When accidental drop of water happen, sediment transport capacity in the main channel of investment and deposits alluvium for deposition in downstream reduced. Reduce levels, provides back water, additional expansion and contraction. So the height of the energy loss of the side spillway and overflow discharge increases. Design discharge to offset increases in the flow of sediment transport. The present confrontation with the overflow stream bed morphology and bed load in a regular channel experiments conducted has not been studied. Results showed that increase in spillway length turbulence in the flow is reduced and morphological changes decrease. Intensity of erosion and sedimentation over time has been increased, in the early minutes of calculations, the rate changes over time in bed was significantly reduced. The results demonstrate the ability of numerical models flow 3d, to simulate the flow in the side spillway.

**Key words:** Overflow side, bed morphology, sediment deposited, side spillway, CFDmodel, Flow 3D .



**Mohammadreza Behrasi and Cyruse Ershadi****INTRODUCTION**

Considering the widespread destruction of the side channels offset overflows and floods that has been occurred, correction the method is necessary. So the design of such structures must be done correctly to reduce construction cost, repair and the annual reconstruction plans flood control. Construction significantly would reduce, If design of spillways in diversion of water spreading systems done according to engineering principles. Degradation that has occurred in the channel system of flood peripherals overflows or hydraulic conductivity of this system is the main motivation for this scheme. Using a mathematical model of the experimental model designed to achieve a basis consistent with the circumstances of this kind of structures can also reduce costs, increase correct understanding of its performance and increased design accuracy for each type of geometry.

Forecast during the transfer process within the main channel and side weir can be both experimental and computational research. Nowadays, numerical methods in computer calculations are important as an efficient tool in the design and reducing construction and engineering costs. In this study numerical model, Flow 3D, was used to simulate side spillway and sedimentation in the channel.

Fluid-sediment interactions control river channel forms and processes. Analysis of spatial hydraulic patterns and the resulting boundary shear stress are required to aid understanding of river system behavior. In this paper, the hydraulic processes active in a side channel spillways simulated using a three-dimensional computational fluid dynamics (Flow 3D) model. Methods employed for the prescription of model boundary conditions are outlined. Model calculations are assessed using comparisons with field observations acquired over a range of flows. Simulations are then used to illustrate flow structures.

Side weirs, also known as a lateral weirs, and overflow dams are free overflow regulation and diversion devices commonly encountered in hydraulic engineering. They are set into the side of a channel or river allowing spilling a part of the discharge over their crest when the surface of the flow in the main-channel exceeds a certain level.

The lateral loss of water is reducing the sediment transport capacity in the main-channel yielding to aggradations and the formation of a local sediment deposit in the downstream weir alignment.

The reduced cross section generates backwater effects and additional contraction and expansion losses. As a consequence, the head over the side weir rises and the side overflow discharge as well. The design discharge to be diverted over the weir is increased by this flow-sediment transport interaction.

Since the interaction of side overflow with bed-load and bed morphology in a channel has not been studied so far, systematic tests have been performed.

Talebbeydokhti et al. (2006) stated that resistance to flow is an important and primary parameter in the determination of water surface elevation. A variety of bed forms, especially dunes, have a sensible effect on total roughness. Because of the complexity of bed form development, previous methods differ drastically from each other in predicting dune bed forms. In this paper, laboratory experiments were conducted to investigate the geometry of dunes in a sand-bed channel and its influence on total channel resistance. The experiments were performed in a flume in the hydraulic laboratory of Shiraz University using sand particles. Simple relations were sought for dune dimensions via some dimensional parameters, and previous methods were compared to each other in light of this new data. Thus, a new boundary condition has been introduced which has always been a free overall in the previous investigations.



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The effective crest length has been taken into account introducing a correction factor for the true crest length. The main-channel geometry in experiments restricted to subcritical flow has been rectangular and the weirs crests have been sharp (7 experiments) and broad crested (15 experiments). The discharge coefficient was assumed to be a function of the approach Froude number ( $Fr_1$ ). For the broad crested weir, an empirical being a function of and crest width was added to the  $c_D$ -relation. The value was invariably maintained greater than 10.00 cm to eliminate effects of viscosity and surface tension that might be important at small heads. With respect to the constant specific energy approach, a difference between the up- and downstream weir corner of less than 2% has been observed. Thus, this assumption has been concluded to be reasonable. The investigations resulted in a design procedure to determine the discharge to be passed into a branch channel.

Imanshoar et al. (2012) stated that subsurface erosion in river banks and its details, in spite of its occurrence in various parts of the world has rarely been paid attention to by researchers. In this paper, quantitative concept of the subsurface bank erosion has been investigated for vertical banks. Vertical banks were simulated experimentally by considering a sandy erodible layer overlaid by clayey one under uniformly distributed constant overhead pressure. Results of the experiments indicated that rate of sandy layer erosion is decreased by an increase in overburden; likewise, substituting 20% of coarse (3.5 mm) sand layer bed material by fine material (1.4 mm) may lead to a decrease in erosion rate by one-third. This signifies the importance of the bed material composition effect on sandy layers erosion due to subsurface erosion in river banks.

Yalin and da Silva (2001) chose the dimensionless chezy friction factor ( $c$ ) to establish a relation for the grain roughness. The main input parameters are the grain size Renolds number ( $Re^*$ ) and the relative flow depth ( $y/d$ ). The resistance due to form roughness is expressed in terms of the bed form length and steepness.

In addition an experimental and numerical study investigating the interaction of a side overflow with a mobile bed has been performed at the laboratory of Hydraulic Constructions (LCH) by Teiller (2000).

Willey et al. (2010) researched that a series of relatively small floods caused extensive rock erosion, approximately 5000 m<sup>3</sup>, in the unlined section of the spillway channel at Googong Dam. A range of protective remedial works were installed during the 1980s with varying success. The most recent phase of work commenced in 2006 with a review of the spillway's performance, assessment of future erosion potential and a comparison of remedial works options. The detailed design was developed for the preferred option, comprising the retro-fitting of a concrete-lined chute, the raising and extension of the spillway chute walls and strengthening of other existing components. Construction is currently underway by the Bulk water Alliance and is due for completion in late 2010. This paper will present details of the history of this project including the initial assessment, review of rock erosion potential, options comparison and the detailed design.

Chiew (1991) stated that none of the classification diagrams refer to non-uniform bed material. For this reason, a classification method for bed features in non-uniform sediments has been proposed.

Interaction between surface and tectonic processes plays a key role in the structural evolution, kinematics, and exhumation of rocks in orogenic wedges. The deformation patterns observed in analog models show that strain partitioning has a strong impact on the vertical component of displacement of tectonic units, which in return favors erosion in domains of important uplift. Partitioning is controlled by tectonic processes and by climate-dependent surface processes, including erosion and sedimentation. The effects of partitioning include localization of deformed domains, exhumation above areas of deep underplating, and steady-state maintenance of wedges for long time periods. Simple models illustrate well how the morphostructural evolution of mountain belts is determined by these complex interactions (Malavieille, 2009).







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Resuming, the literature review indicates that at the current stage of research lateral overflow on fixed bed conditions is well studied. The same accounts for expressions referring to the side weir discharge coefficient, sediment transport and bed morphology. Almost no investigations deal with the interaction of lateral overflow, sediment transport and bed morphology as a combined problem and no integral approach relating them to each other have been developed yet.

#### Numerical model description

The numerical model used in this study is the CFD Method, Flow 3d software is an abbreviation for Sediment Simulation in Intakes with Multiblock option. It solves the Reynolds-averaged Navier-Stokes equations with the two equation k-ε turbulence closure in three dimensions to compute the water flow using the finite volume approach as discretisation method. Flow 3d is based on the solution of the Navier-Stokes equations, with the k-ε model.

This gives the water velocity and turbulence field which is used for solving the convection-diffusion equation for the sediment concentration. The model simulates water and sediment movement in a complex three-dimensional geometry. The model has a graphical user interface with pre and post processors. This paper shows several examples where the program has been used. The initial motivation for making Flow 3d was the limited possibilities of determining the flow of finer sediment particles in a complex geometry.

#### Equations governing this phenomenon

Bed load and suspended load sediment transport is usually divided into two groups. Suspended load can be determined by the equation (Convection-diffusion) for sediment concentration (C). Generally transport equation for sediment concentrations case is according to the Equation 1-5.

$$\frac{\partial \overline{u}_i}{\partial x_i} = 0$$

#### Conservation of mass (continuity equation)

$$\frac{\partial \overline{u}_i}{\partial t} + u_j \frac{\partial \overline{u}_i}{\partial x_j} = -\frac{1}{\rho} \frac{\partial \overline{P}}{\partial x_i} + g_{x_i} + \frac{\partial}{\partial x_j} \left( \nu \frac{\partial \overline{u}_i}{\partial x_j} - \overline{u_i' u_j'} \right)$$

#### conservation of momentum (Navier-Stokes equations)

That  $x_i$ , Representative axis,  $U_i$  average speed to the X (to flow), Y (side) and Z (vertical), P pressure,  $\rho$  fluid density and  $\overline{u_i u_j}$  the Reynolds stress tensor components.

The Reynolds stress model and in better words, closing the system equations brovide, used turbulence model. Model  $\epsilon$ -K, the most common and most widely used turbulence model for engineering issues known at the present time, this model is widely used and valued.





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The governing equations for this model are expressed by the following relationship

$$\rho \frac{Dk}{Dt} = \frac{\partial}{\partial x_i} \left[ \left( \mu + \frac{\mu_t}{\sigma_k} \right) \frac{\partial k}{\partial x_i} \right] + G_k + G_b - \rho \varepsilon$$

(3) Equation K:

$$\rho \frac{D\varepsilon}{Dt} = \frac{\partial}{\partial x_i} \left[ \left( \mu + \frac{\mu_t}{\sigma_\varepsilon} \right) \frac{\partial \varepsilon}{\partial x_i} \right] + C_{1\varepsilon} \frac{\varepsilon}{k} (G_k + C_{3\varepsilon} G_b) - C_{2\varepsilon} \rho \frac{\varepsilon^2}{k}$$

Equation  $\varepsilon$ :

Vortex of viscosity in the above equation is defined by the following equation:

Equation Vortex of viscosity:

$$\mu_t = \rho C_\mu \frac{k^2}{\varepsilon}$$

W Fall velocity of sediment particles, U Flow rate, X Dimension and is total confusion and diffusion coefficient of molecular diffusion coefficient. Value of  $\mu_t$  as the coefficient of viscosity and obtained by turbulence model.

d Average particlediameter (D 50), Critical shear stress for sediment movement (Shields diagram is obtained) and  $\rho_s, \rho_w$ : The mass per unit volume of water and sediment grains are.

## MATERIALS AND METHODS

### Laboratory flume

The experiments have been conducted in a recirculating rectangular prismatic glass-sided open-channel main flume being 40.00 m long, 2.00 m wide and 1.20 m deep. The flume slope was horizontal; the requested bottom slope of the mobile bed has been achieved by adjusting the sediment layer. The main flume was subdivided longitudinally into two separate channels. The first channel, 20.00 m long and 1.50 m wide represents the actual testing facility with the mobile bed. The second one, 0.47 m wide, constitutes a lateral channel enabling to evacuate the laterally diverted discharge.

The side weir was located on the right channel bank 5 m or 40 flow depths from the main channel inlet (test series B). The crest was horizontal and rectangular with a crest width of 0.035 m. the up-and downstream weir corner consisted of semi-circle profiles.

At the end of the mobile bed reach a plate has been installed to fix the sediments. The collection of bed material transported out of the main channel was attained by the arrangement of three restitution basins at the channel outlet.

A group of test have been carried out in a 20.00 m long, 1.50 m wide and 1.20 m high rectangular flume and consisted of a 3.00 m long side weir, that they were simulated in Flow 3D.



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The overall flow regime has been subcritical. The average initial bottom slope was 0.21%. The mobile bed was characterized by a median particle size of  $d_{50}=0.72$  mm. During the simulation the water surface, the 2D-velocity field, the side overflows discharge and sediment supply was measured.

**Numerical modeling and analysis results**

The software Flow 3D field network solutions, has been done in the editor of network software. In order to reduce computation time, network size has compacted in spillway due to velocity gradient. For the dimensions of a network  $3 * 3 * 3$  used (From left to right, respectively, the number of grid lines in the x, y and z). The network created by network software in Flow 3D is as shown in Figure 1. Sediment transport roughness for calculation was about  $d_{50} = 0.00072$ . Figures 2 and 3 showed Channel shape and its spillway.

The final shape of the substrate with one side weir (condition B) has been showed in Figure 4. This study presents the development and comparison performed in the numerical model Flow 3D and a prototype. This study examined the model results with respect to those observed in the field as shown in Table 1) in order to determine whether the numerical model (Flow 3D) is able to predict velocity distribution in the study reach.

Results of the experiments have been shown on the graph (Figure 5). According to Figure 5 discharge with sediment and without sediment is close together. The difference between them was about 7%, so there is a little difference and it's ignored.

**CONCLUSION**

The results of the simulation can be summarized in two parts hydraulically stream sediment and Hydraulic.

In this study systematic experimental flume has been simulated in Flow 3D. According to the result, water and sedimentation simulation in Flow 3D can show the situation of the flume in any characteristics.

For determining the water flow, sediment transport, bed deposition and its pattern Flow 3D can be used effectively at all stages of project. Care is required to prepare grid and control file. It is strongly recommended for further study Flow 3D has great potential. According to the results obtained by this study, the following conclusions are reached:

1. The rate of erosion and sedimentation over time has been an increasing trend, so that in the early minutes of the start of the calculations, changes in the bed has had a reduced rate of change over time.
2. A good relation was observed between the measured and computed values of velocity at the study reach in three dimensions.
3. The Flow 3D is one of the useful tools to predict the velocity distributions in three dimensions which gave good idea about the behavior of the flow velocities.
4. With regard to the flow pattern in the vicinity of the side overflow, the model under consideration under simulated conditions. High speed near the beginning of the overflow event scour the bottom side effects channel is also clearly evident in the speed and depth of results.
5. Changes in the substrate form a direct impact on the flow pattern in the main channel and adjacent side is overflow. The rise and fall of the ground floor of scour, and sedimentation of suspended sediment deposition,





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hydraulic parameters have been tangible changes. Increase the volume of water passing through the spillway side is one of the most important changes.

6. Continuous changes as well as changes in the context of hydraulic parameters tremendous impact on the stability of numerical modeling and process simulation is very heavy. However, accumulation of error in each interval and the limited size of calculate has been one of the difficulties ahead.

7. In the vicinity of the side weir significantly deposition is evident. This leads to changes in the flow of energy within the overflow side. Since the current in the main channel under critical conditions, this deposition causes rising sea levels and increased flooding in the vicinity of the side overflow it.

8. Current output side overflow after calibration laboratory model 0/037 cubic meters per second of knowledge. This model number is estimated to nearly 0/054 cubic meters per second. According to the results of numerical and experimental observations, pattern and form of bed scour the average error was calculated at 7%.

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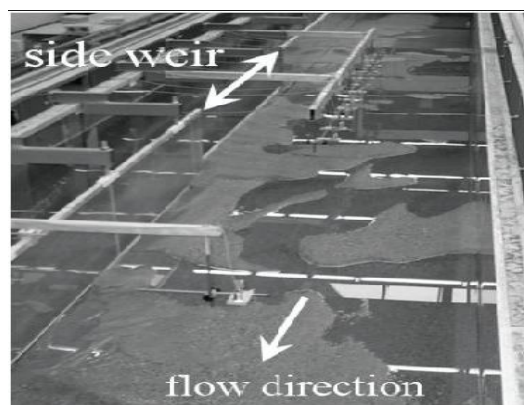
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**Figure 1. Laboratory setup with main channel and mobile bed, side weir and evacuation channel**





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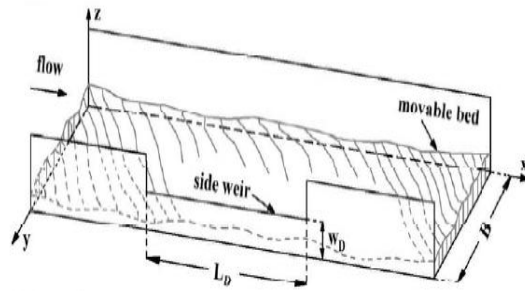


Figure 2. Definition sketch of experimental setup for one side weir

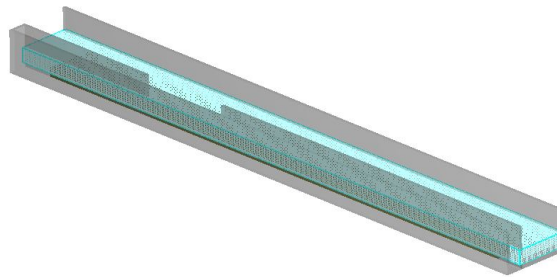


Figure 3. View of the mesh network in FLOW 3D.

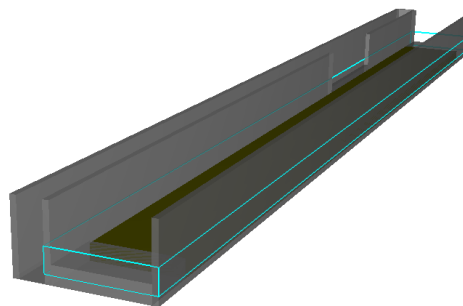
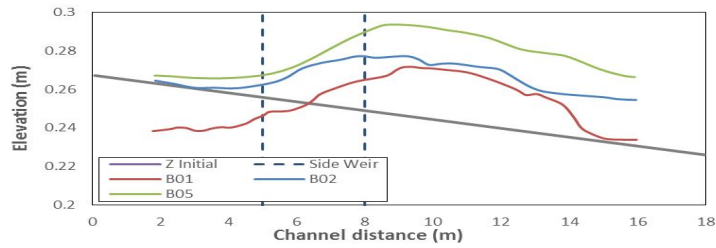


Figure 4. The final shape of the substrate with one side weir (condition B).

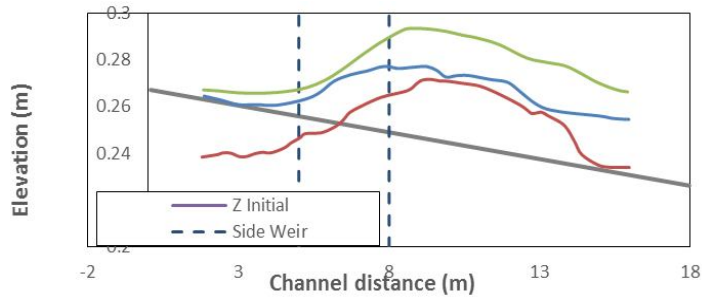




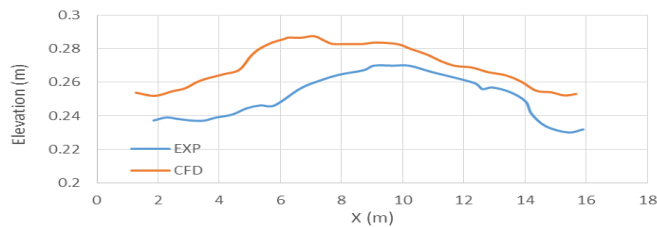
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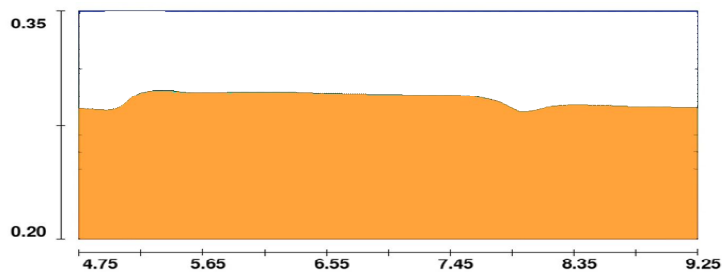
**Figure 5.View of the morphological changes in flow.**



**Figure 6.changes in the form of an overflow basin for test B.**



**Figure 7. Comparison between the numerical and experimental results of scour in the vicinity of the side overflow**



**Figure 8.Model scour the bed in the longitudinal sections at various time intervals**





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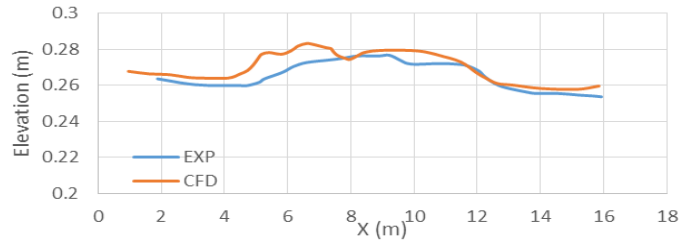


Figure 9. Comparison of results between the numerical and laboratory scour in the vicinity of the side overflow

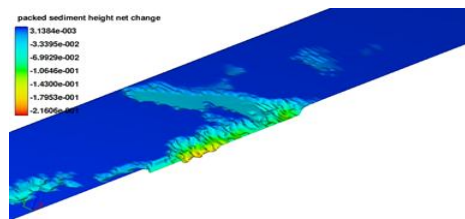


Figure 10. View of 3 D channel and side weirs

Table 1.Channel characteristics in B(with one side weir).

| No. of experiments | No. of weirs (nD) | Length of weir crest (LD(m)) | Sill heigh t(wD (m)) | Bottom Slope (S0 (%)) | Upstream discharge(Q1 (l/s)) | Sediment supply (Qsb/in) (kg/min) |
|--------------------|-------------------|------------------------------|----------------------|-----------------------|------------------------------|-----------------------------------|
| B01                | 1                 | 3.00                         | 0.10                 | 0.2                   | 131                          | 8.70                              |
| B02                | 1                 | 3.00                         | 0.10                 | 0.2                   | 181                          | 17.73                             |
| B03                | 1                 | 3.00                         | 0.10                 | 0.4                   | 177                          | 9.10                              |
| B04                | 1                 | 3.00                         | 0.10                 | 0.1                   | 98                           | 9.67                              |
| B05                | 1                 | 3.00                         | 0.10                 | 0.2                   | 144                          | 16.72                             |







## Effect of Inflation on Investments of the Parsian Insurance Company

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Received: 18 Mar 2015

Revised: 27 Apr 2015

Accepted: 30 May 2015

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### ABSTRACT

The purpose of this study was to evaluate the effect of inflation on investments of Parsian Insurance Company over a 5 year period from 2009 to 2013. The used methodology is practical and documentary to collect data and descriptive-correlation. First, the Arch LM test was used to examine the variance anisotropy; then, F statistics and Hausman test were used to evaluate the significance of fixed effects method. Finally, Eviews was used to test hypotheses and process data. The results showed that inflation negatively influenced short-term investments of Parsian Insurance Company; in addition, fluctuations in inflation negatively influenced long-term investments of the Parsian Insurance Company.

**Key words:** inflation, short-term investment, long-term investment, Parsian Insurance Company

### INTRODUCTION

Currently, one of the key factors for economic growth and development is to increase productive investment. There is a direct relationship between economic development and investment. The world has accepted that poverty reduction depends on balanced economic growth through increased investment. Insurance industry is the major financial institution active in the markets, especially capital markets, which can both provide security for economic activities and play a vital role in mobility and dynamics of financial markets and funds to invest in economic activities through insurance services. Thus, investment is a major activity of an insurance company. The profit from this investment forms a significant part of the assets. In return for a premium, policyholders provide customers with insurance policy in which they commit to pay for damages caused by any accidents to comply with the obligations of



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the insurance policy. The premium paid by the insured to the insurer is used by the insurer in two cases. A part of it is held by the insurer, a large part is invested in various markets, including the housing market, stock market and stock exchange, gold and foreign exchange market and even in the form of bank deposits and bonds. In fact, the insurer's total profit is from insurance operations and profit from investment activity (Karimi, 2007). The purpose of study is to determine the parameters effective on the profits from these activities. The most important parameters are economic parameters including macroeconomic indicators such as GDP, inflation, unemployment which are effective on both investments of the insurance company and the insurance market.

In Iran, the recessive inflation is rising steadily. This means the increased inflation is followed by economic recession (Jafarzadeh, 1997). The increased inflation rate drops return on investment (ROI) leading to lower profit from investment of insurance companies. The fluctuations in inflation encourage people to buy fixed assets, which are followed by reduced investments in the stock market. This reduces the profit from investments of insurance companies.

The insurance industry is one of the pillars of economic development. Economic actors have been interested in insurance for its mechanism to reduce the risk of any activity. There is a direct relationship between development of insurance and development of an economy (Momeni-Vesalian & Daghighi-asl, 2012). Restoration of the economy, increased trade, promotion of living standards and development of investment improves insurance of an economy and subsequently develops and promotes the livelihood of people, preserves national wealth and forms a large savings (Azizi & Abasi, 2012). In the current global economy, inflation is one of the major problems in some countries such as Iran. Inflation, exceeding the acceptable and accepted limit predicted in the long-term economic plan, influences the financial relationships between individuals and companies. Inflation influences the amount of investment in various sectors, such as insurance. Currently, insurance companies are widely investing in the financial and capital markets. Many companies have started to work in this sector; however, the amount of their investment activities depends on many factors, including inflation rate.

Bearing in mind that premiums accumulate large sums of capital for insurance companies. This capital needs to be used to meet the needs of owners for growth and prosperity of the national economy. Premiums can be identified as saving money in banks. Insurance companies as a legal entity are obliged to invest surplus funds for prosperity and development of the economy. The insurance industry as well as other economic and social sectors is influenced by inflation (Momeni-Vesalian & Daghighi-asl, 2012). It seems essential to evaluate the effect of fluctuations in inflation on investments by the insurance companies. This study finds out whether inflation influences the investments by insurance companies. For this purpose, the Parsian Insurance Company will be studied as the largest private insurance company in Iran.

**LITERATURE REVIEW**

Hosseini-Nia (1996) highlighted the investments of the commercial insurance companies in Iran during 1989-1993. She concluded that commercial insurance companies do not invest their capital and reserves properly.

Jafarzadeh (1997) examined the effects of inflation on the insurance market using three different methods. The results of the first method showed that the profitability and real industrial return of the insurance industry was negative in most years. Based on the findings of the second method, the inflation had more effects on the changes in received premiums than the changes in the paid compensations. In addition, the predicted inflation rate had negative effect on insurance premiums received for life insurances. Through the third method, the demand model and estimation revealed a positive relationship between income and education and the demand for life insurance and a negative relationship between inflation and unemployment, which is consistent with theoretical and empirical works.





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Jahankhani (1997) reviewed the investments of insurance companies and their portfolios. He concluded that insurance companies do not use their financial resources properly in investments.

Ahmadvand (2000) examined the role of insurance in capital market of Iran during 1997-1981. By reviewing and calculating the new indicators of the role of insurance companies in the national economy and financial markets, especially capital markets, he concluded that the figure of productive premiums, premium per capita, penetration rate and composition of life and non-life insurances are improper in Iran and the role of insurance industry is minimal in GDP.

Abdi-Tabrizi (2001) examined the role of insurance industry in general developments of the capital market and the insurance funds in development of new financial instruments in the international system. He concluded that the insurance system of Iran needs reform; to improve the payments, the insurance industry has no choice but to expand the areas of investments for funds from the premium and flow of the funds into the capital market. Abbaszadegan (2001) examined the role of insurance in capital market during 1988-1997; by evaluating the indicators including premium, insurance penetration rate, premium per capita and the share of earned premiums on property and people, he found a significant relationship between development of capital market and economic growth.

Mehra and Rajabian (2006) estimated the life insurance demand function for 1966 to 2003 using time series models and ARDL and OLS and analyzed the long-term and short-term relationships of variables. Then, they fitted the function to oil-rich countries with average income for 1998-2002 using panel data. The results showed a negative relationship between education and the demand for life insurance as opposed to theoretical expectations. Hadian and Roham (2010) studied the permanent inflation and its effect on private investment. They found that only long-term inflation reduces private investment.

Aziz et al (2012) examined the effect of inflation on the demand for life insurance in the third and fourth socio-economic and cultural development. They found a difference in the demand for life insurance and inflation in the third and fourth development plans. Gorbani (2012) analyzed inflation in Iran during 2008-1958 using Grash Class. This model has the ability to analyze the hidden inflation directly. The results suggest that future hidden inflation will be very sensitive and unexpected.

Several researchers emphasized the positive relationship between life insurances and income from theoretical aspects; for example, Campbell (1980) found a positive relationship between national production and demand for life insurance. Beenstock et al (1988) studied the relationship between premium of responsibility and income in 50 developing and developed countries. They considered a model, as follows:

$$Lq = -7/39 + 1/341 GDP$$

$$(t\text{-start}(-14/3) \quad (22/21))$$

$$R=0/918$$

where,  $q$  is the premium on responsibility insurance;  $GDP$  represents gross domestic production;  $L$  is the Neper logarithm.

They found a positive relationship between premium and  $GDP$ ; they concluded that the income elasticity was greater than unit.

Lewis (1989) experimentally showed a positive relationship between demand for life insurance and income.



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Kontonikas (2004) examined the effects of inflation, unemployment and economic growth in investments of the British insurance companies and, consequently, the profit of insurance companies active in Lloyd's market in the form of panel data for 2007 to 2000. He concluded that inflation and uncertain inflation, unemployment, economic growth and uncertain economic growth increase the risk of insurance companies. This forces companies to invest on entities with less return such as bonds and bank deposits, whereby reduces the profit of insurance companies and leads to the loss of these companies in some cases.

**Hypotheses****Main Hypothesis**

H<sub>0</sub>: inflation is not effective on investments by Parsian Insurance Company.

H<sub>1</sub>: inflation is effective on investments by Parsian Insurance Company.

**First Hypothesis**

H<sub>0</sub>: inflation is not effective on short-term investments by Parsian Insurance Company.

H<sub>1</sub>: inflation is effective on short-term investments by Parsian Insurance Company.

**Second Hypothesis**

H<sub>0</sub>: inflation is not effective on long-term investments by Parsian Insurance Company.

H<sub>1</sub>: inflation is effective on long-term investments by Parsian Insurance Company.

**MATERIALS AND METHODS**

This study uses a practical, descriptive-correlation methodology. Data was collected by a documentary method. The purpose of this study is to investigate the effect of inflation on investments of the insurance companies; thus, the data related to economic variables was collected from financial records available in the Central Bank and the Statistical Yearbook published by the Statistical Center of Iran. The data required for calculations was extracted from these reports and imported to EXCEL for calculations. The hypotheses were tested by Eviews software and ordinary least squares (OLS) regression.

**Materials**

Data was collected by library studies. By studying books, articles and analytic dissertations, data was collected for theoretical background. The data on inflation and investment was extracted from economic records available in the Central Bank, balance sheets, statements of cash flows of the insurance company.

**Methods**

Data analysis is a multi-stage process in which the data collected by materials from the sample is summarized, coded, classified and finally processed to establish a relationship between different types of analysis and data in order to test the hypothesis. This study analyzed the hypotheses considering the number of observations in each year by integrating cross-sectional and time-series data (panel data) and using multivariable analysis, comparing means of two samples and Eviews software.



**Maral Tizro and Mohammad Reza Pourali****RESULTS**

This section explains the descriptive results, analyzes data and reviews the findings descriptively and analytically. For the descriptive part, the central indices and distribution is used in the form of statistical tables to describe the variables. For the analytical part, the Arch LM test is used to examine variance anisotropy; then, F-value and Hausman test are used to examine the significance of the fixed effects approach. Finally, the hypotheses are tested.

**Descriptive Statistics**

Descriptive statistics, which usually describe data, use indicators of central tendency and distribution to express the collected data. To present the results, minimum and maximum means of distribution parameters such as variance and standard deviation are usually used. According to Table 1, the mean inflation is 0.245, the mean short-term investment is 0.326 and the mean long-term investment is 0.424.

**Variance Anisotropy**

Arch LM is used to test variance anisotropy of disturbance terms. Table 2 shows the results of variance anisotropy by Arch LM.

According to Table 2, the test statistic is not significant at 5%; thus, the variance anisotropy is rejected for disturbance terms.

**Significance of the Fixed Effects Method**

According to the results presented in Tables 3 and 4, the likelihood is less than 5% in both tests (F and Hausman); therefore, the fixed effects method is used for the regression model.

According to Table 5, there is no significance level in 5% error level; therefore, data are normal.

**First Hypothesis**

H<sub>0</sub>: inflation is not effective on short-term investments by Parsian Insurance Company.

H<sub>1</sub>: inflation is effective on short-term investments by Parsian Insurance Company.

According to Table 6, the Durbin-Watson test ranges from 1.5 to 2.5; therefore, there is no correlation between errors and regression can be used. F-value (55.159) is significant at error level <0.01; therefore, it can be concluded that the regression model consisting of independent, dependent and control variables is a good model and the independent and control variables can predict the variations in the amount of investment. The adjusted coefficient of determination is 0.638, indicating that 63.8% of the total variation in the dependent variable is related to the independent variable. According to Table 5, the impact factor of inflation on short-term investments is -0.814, which suggests a negative and reverse effect of inflation on short-term investments of Parsian Insurance Company. On the other hand, t-statistic related to inflation on short-term investments (0.035) is less than 5% error level; therefore, H<sub>0</sub> can be rejected by 95% confidence. Thus, inflation has a negative effect on short-term investments of Parsian Insurance Company.



**Maral Tizro and Mohammad Reza Pourali****Second Hypothesis**

H<sub>0</sub>: fluctuation in inflation is not effective on long-term investments of Parsian Insurance Company.

H<sub>1</sub>: fluctuation in inflation is effective on long-term investments of Parsian Insurance Company.

According to Table 7, the Durbin-Watson test ranges from 1.5 to 2.5; therefore, there is no correlation between errors and regression can be used. F-value (41.583) is significant at error level <0.01; therefore, it can be concluded that the regression model consisting of independent, dependent and control variables is a good model and the independent and control variables can predict the variations in the amount of investment. The adjusted coefficient of determination is 0.473, indicating that 47.3% of the total variation in the dependent variable is related to the independent variable. According to Table 6, the impact factor of fluctuations on short-term investments is -2.621, which suggests a negative and reverse effect of fluctuations on short-term investments of Parsian Insurance Company. On the other hand, t-statistic related to fluctuations on short-term investments (0.009) is less than 5% error level; therefore, H<sub>0</sub> can be rejected by 95% confidence. Thus, fluctuation in inflation is effective on short-term investments of Parsian Insurance Company.

**CONCLUSION**

In order to assess the determinants of investment by insurance companies in Iran, this study noted several factors. It was concluded that the variables effective on investments of insurance companies in Iran include inflation, GDP, GDP per capita, literacy rate and real interest rate.

The first hypothesis showed that inflation has negative effect on short-term investments of Parsian Insurance Company, which is consistent with Abbaszadegan (2001), Jafarzadeh (1997) and Hadian (2010) and inconsistent with Tabrizi (2001) and HosseinNia (1996).

The second hypothesis showed that inflation has negative effect on long-term investment of Parsian Insurance Company, which is consistent with Azizi (2012) and Rajabian (2005) and inconsistent with Ahmadvand (2000).

Both hypotheses are supported; therefore, the main hypothesis is accepted. Inflation reduces short-term and long-term investments; this reduces the intrinsic value of investments and substantially reduces the value of companies. Insurance companies need to evaluate the risk and return on their investments carefully to prevent a reduction in the value of the company.

It is suggested to conduct further research in the light of insurance companies and compare the results and examine the effect of inflation and its fluctuations on the sales of insurance policies.

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**Table 1: Descriptive data**

| Variable              | Minimum | Maximum | Mean  | Standard deviation |
|-----------------------|---------|---------|-------|--------------------|
| Inflation             | 0.096   | 0.357   | 0.245 | 0.508              |
| Short-term investment | 0.157   | 0.702   | 0.326 | 0.669              |
| Long-term investment  | 0.129   | 0.832   | 0.424 | 0.325              |

**Table 2: Results of Arch LM**

| Description   | Value    | Likelihood |
|---------------|----------|------------|
| F-statistic   | 1.102296 | 0.095      |
| Obs*R-squared | 1.221087 | 0.095      |

\* 5% error level

**Table 3: F statistics test**

| Description              | Value      | Degree of freedom | Likelihood |
|--------------------------|------------|-------------------|------------|
| Cross-section F          | 2.962154   | 123               | 0.005 *    |
| Cross-section Chi-square | 139.102596 | 123               | 0.011 *    |

\* 5% error level





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**Table 4: Hausman test**

| Description     | Value    | Degree of freedom | Likelihood |
|-----------------|----------|-------------------|------------|
| Cross-section F | 6.325405 | 36                | 0.018 *    |

\* 5% error level

**Table 5: Normality by Jarque-Bera test**

| Variable              | Statistics | Sig.  |
|-----------------------|------------|-------|
| Short-term investment | 0.962      | 0.165 |
| Long-term investment  | 1.114      | 0.082 |

**Table 6: Regression test of the first hypothesis**

| Variable                              | Impact factor | Deviation of estimate | T-statistics | Sig.    |
|---------------------------------------|---------------|-----------------------|--------------|---------|
| Fixed                                 | 1.662         | 0.265                 | 6.271        | 0.015 * |
| Inflation                             | -0.814        | 0.187                 | -4.352       | 0.035 * |
| Durbin-Watson                         | 2.014         |                       |              |         |
| The coefficient of determination      | 0.685         |                       |              |         |
| Adjusted coefficient of determination | 0.638         |                       |              |         |

\* 5% error level

**Table 7: Regression test of the second hypothesis**

| Variable                              | Impact factor | Deviation of estimate | T-statistics | Sig.    |
|---------------------------------------|---------------|-----------------------|--------------|---------|
| Fixed                                 | 0.925         | 0.126                 | 7.341        | 0.006 * |
| Durbin-Watson                         | 1.715         |                       |              |         |
| The coefficient of determination      | 0.489         |                       |              |         |
| Adjusted coefficient of determination | 0.473         |                       |              |         |

\* 5% error level

