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RESEARCH ARTICLE

The Impact of the Internal Control Quality on Cash Flow and Earnings Quality

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ABSTRACT

In this study, the relationship between the impact of internal control on cash flow and earnings quality were reviewed for firms listed in Tehran Stock Exchange for the years 2008-2012.The purpose of this study was the investigation of the relationship between the impact of internal control quality on the cash flow and earnings quality; we first evaluated the quality of internal controls through accounting reports.Then we focused on cash flow and earnings quality. Cash Flow measure will be “1” if the cash flow of the company in the next presented report be lower, otherwise it will be zero,We measure earnings quality based on Dechow and. Dichev model (2002) as a measure of earnings quality Our findings showed direct evidence of the link between the quality of internal control and earning quality which can be considered in decisions being made by investors or performed analysis.Our findings also suggest cash flow is not associated with weakness or lack of internal control therefore Since there is no significant relationship between internal control and cash flow, it is recommended this criteria ignore in future analyses about the quality of internal control

Key words: cash flow, earnings quality, internal control quality

INTRODUCTION

Profit and Loss Report of an economic unit is information that accountants prepare it and it has special attraction for users. Accounting profit is composed of two parts, The cash part, i.e. The cash benefit obtained over a period within

this part and the accruals part that is far more important for evaluation of the company performance.As a result, the factor which can best represent the company's performance is the benefit accrual accounting(Nazemi, 2005). However, due to constraints such as earnings management and manipulation of accruals, subject called "The quality of accruals" (a measure of earnings quality) is considered in terms of their assessments and decisions. One of the reasons that analyst may distinguish between the real benefit and calculated one is that there is the possibility that profit to be manipulated by the administrator. This manipulation is possible through the use of alternative accounting management (Kordestani, 2004).Cash flow and internal financial controls have important role in identification of the quality of financial reporting. Strong internal controls that minimize the possibility of intentional or unintentional distortion by the staff and management to the least possible will increase the reliability of financial reporting and increases financial statement items accuracy.The company's cash flow from operations, due to the strong motivation to take advantage needs internal control with high levels. Previous studies have shown that internal control weaknesses resulted in the restatement of cash flow reports. Of course, an internal control weakness is not just reason of a restatement of report (Balkoui, 2002).The weakness in internal control can encourage management to manipulate the earnings and earnings management activities (Ferreira, Vilela, 2004).In other words, the lack of implementation of qualified internal control could be due to earnings management incentives. In this study, considering the quality of internal controls, we want to examine its impact on earnings and cash flow management. It is assumed that firms with weak internal controls have opportunities for management to manipulate earnings and also misuse of funds (Shourvarzi, 2010).

Problem definition and research objectives

Since the accounting profit is one of the items presented in the financial statements and has always attracted the attention of investors, but the real benefit is not always equal to accounting profit and company.The profits are distorted Orinmore contemporary expression, the earning are managed with various reasons and motives. Earnings management can only be to protect the interests or the interests of the company or both (Garcia-Teruel et al., 2009).

Another resource that are considered by most investors is the company's cash flow because itshows the power company's current debt repayments and can be a basis for evaluating the company reported profit as what percentage of reported profits is accruals and what percentage is cash. In this way, the report also shows a kind of earning quality. Both items of accruals and cash flow are at great risk due to their important role and can be manipulated by management. The internal control procedures and mechanisms have been considered in recent years in the country to reduce opportunities for profit-seeking enterprise management and staff. However, in other countries internal controls have been considered in previous decades and are the requirement for companies to be listed. Recently audit firms have examined these controls and investigate them in the quality and the implementation view points and have offered them in their audit reports individually as the strengths and weaknesses of controls in relation to internal controls (Balkoui, 2002).

In this study, the quality of internal control reported by auditors on the reported earning quality of earnings and also a cash flow stream is investigated. Previous research in developed countries shows that firms with weak internal controls have to renew their cash flow report. Examination of the quality of internal controls effect on the quality of earnings and cash flow is the main question of this study. Because the quality of internal control has recently been considered, similar research on the topic of this paper is not available. In this study, the quality of internal control reported by the auditors on the reported quality of reported earnings and also presentation of a cash flow was investigated.

Due to lack of proper quality and accurate reports about the internal controls quality, in this study the audit report and the provisions of this report is used for the separation of companies with high quality of internal control from low-quality ones.

The research hypotheses are as follows

Hypotheses no.1: There is a significant relationship between the quality of internal controls and cash flow.

Hypotheses no.2: There is a significant relationship between the quality of internal controls and earning quality.

Research Method

The present study is the applied research.This type of research is applied one because it can be used for the stock exchange, financial analysts and stock brokers, financial managers of companies, universities and centers of higher education and research of the audit.

In the inference method view point, this research is a descriptive – analyticone. Descriptivestudy describes the fact without its manipulation. This type of study is designed to collect data to test the hypothesis or answer questions about the current status of the study subjects.

From the type of study design, current investigation is the event study. In this study, the relationship between environmental variables and the data that existed in the normal way or past events occurred without direct intervention research is collected and analyzed.

Variables

Independent variables

Quality of internal control: According to the definition provided by the Commission's Working Group on Financial support organizations Tõrdu) in the Journal of Internal Control-Integrated Framework- internal controls is a process that is designed to provide reasonable assurance to achieve three following objectives

1. Effectiveness and efficiency of operations,
2. The reliability of financial reporting, and
3. The rules and regulations observance

It is designed and implemented by managers and employees of the organization. First group refers to the main objectives of an economic unit, including goals related to performance, profitability, and asset protection. The second group is related to the process of the preparation of reliable financial reports for general purposes. The third group, also by complying with the rules and governing regulations deals with the economic activities. Each of these groups, while have the common areas; deal with different requirements that provide the precise focus area to meet the diverse needs. To assess the quality of internal control, the audit report in 2013 is used. In The audit reports due to the internal control evaluations are legal and mandatory, strengths and weaknesses of the internal control systems are reported by the auditor.

Dependent variables

Cash flow: It is the cash reported in the company's annual cash flow from the main operations of the company. In This study, the rise and fall of this variable will be considered and the measure of this variable will its increase or decrease so that if in the next annual report the cash flow resulting from the company's main activities increase, it will be “1”Otherwise, it will be“0”.

Earnings Quality

Given the role of accruals accounting in earnings calculation, its quality is important for investors. Investors to analyse earnings quality can use measure namedthe quality of accruals to recognize that what amount of earning is cash and how much of it is Accruals. Accruals show that in the future cash flow increases and if this happens, it can be concluded that the proposed profit has honesty and can be confirmed.

To calculate the earning quality, the model of profit margin obligations consistent with the company's performance (Kvthary et al., 2005) was used. The model is described in detail in the model section. Earnings quality is means when the financial analysts explain to what extent the reported earnings, reflect a real benefit. Investors' perceptions of the real profit are the profit from ordinary activities which is repeated in the next financial year and generating cash flow. Earning Quality refers to both the characteristics of the usefulness in decision-making and the relationship between economic gain and earning quality.

Control variables

Sales growth: This variable is equal to the change in sales from last year to this year. If these changes have increased aspects will lead to the positive growth of sales and when the changes have decreasing trend, they show negative growth of the company.

Operating profit of the company

The profits from the Company's activities and operations are the company's operating profit. Operating profit is more important than net income and profits derived from other non-current and unusual activities of company and represent the actual performance of the company.

The auditor

In this study, an independent auditing firm are divided into two categories based on the quality of work. Even if an independent audit is the audit company, the number 1 and otherwise the number 0 will be selected.

Company Size

To assimilate the data and control the impact of firm size on the results of assumptions, the company size that is produced from the natural logarithm of the company's assets was included in the models.

Number of board members

The number of board members is one of the mechanisms of corporate governance expected tohave more impact on the control board decisions by increasing the number of board members.

Independence of the Board

Board independence is equal to the ratio of non-bound board members to the total number of board members.

Data collection

Data needed to test the hypothesis are collected by visiting the website of the Stock Exchange and listed companies in and using the annual financial statements and their explanatory notes andthen the data were completed and controlled using spread sheet software,.

Population and sampling method

First the library method was used to collect information about the theoretical literature then the raw data collected from software TadbirpardazandRahavardNovin, CDs of modern financial information, and website of research management, development and Islamic studies related to the Stock Exchange and then the data were classified in Excel and finally, the data were analysed in the software E-views.

For this study, the companies listed in Tehran Stock Exchange that have the following conditions are considered as the population:

1. Companies with same fiscal period ending in March elected.
2. The financial information for the period of study is available.
3. Trading Companies without interruption for more than 4 months.
4. Before the year 2008 the company is listed on the Stock Exchange.
5. Company is not listed in investment and financial institutions and the banking and insurance industry.
6. They were active between the years2008 to 2012.

After consideration of the above conditions, sample will be selected using models of sampling.

Accordingly, companies that due to limitations imposed by the choice have been met necessary conditions are examined for a period of five years from the beginning of 2008 until the end of 2012.

Thus, the sample consisted of information of 73 companies that are selected by considering the above conditions.

Design and test hypotheses

Hypotheses no.1: There is a significant relationship between the quality of internal controls and cash flow.

If we want to explain the above hypothesis in a statistics way, we have

$$\begin{cases} \mathbf{H_0\ There\ is\ no\ significant\ relationship\ between\ the\ quality\ of\ internal\ controls\ and\ cash\ flow.} \\ \mathbf{H_1\ There\ is\ a\ significant\ relationship\ between\ the\ quality\ of\ internal\ controls\ and\ cash\ flow} \end{cases}$$

The first research hypothesis we want to examine is the effect of internal control on the Cash Flow and given that the dependent variable is a binary values, we will use logistic regression models, fitted model is as follows.

$$TURN = \alpha_0 + \alpha_1 ICW + \alpha_2 GROWTH + \alpha_3 LOSS + \alpha_4 BIGN + \alpha_5 SIZE + \alpha_6 BOARD + \alpha_7 IBOARD + \varepsilon_{i,t}$$

The first table shows the results of significance tests of the logistic model. The three parameters are the same in this table. These statistics will be different from each other only when in the entry of predictor variables, the forward,

backwardandstep by step methods are used, and otherwise all three parameters are the same. As seen in this table, the p-value is greater than 0.05. Therefore, the null hypothesis will be accepted with confidence 0.95,i.e. the model is not significant with 95% confidence.

The results above show that only the independence of the Board of Directors index is0.036that is less than 0.05therefore other variables have no significant impact on the cash flow. Significance level corresponding to the quality of internal control is 0.664 and more than 0.05. Therefore, the first research hypothesis that "There is a significant relationship between the quality of internal controls and cash flow "will be rejected with confidence of 0.95.

Hypotheses no.2: There is a significant relationship between the quality of internal controls and earning quality.

If we want to explain the above hypothesis in a statistics way, we have:

$DA=\alpha_0+\alpha_1 ICW+\alpha_2 GROWTH+\alpha_3 LOSS+\alpha_4 BIGN+\alpha_5 SIZE+\alpha_6 BOARD+\alpha_7 IBOARD+\varepsilon_{i,t}$

H_0 There is no significant relationship between the quality of internal controls and earning quality

H_1 There is a significant relationship between the quality of internal controls and earning quality..

The results above show that the Fisher test ($F_{df_1=7,df_2=342}$ = 27.602) isgreater than the corresponding statistics presented in Fisher Table thus the fitted model was significant and its performance is acceptable .($p-value$= 0.00<0.05).Also, the significance level corresponding to the Limertestis more than 0.05therefore the data estimation method is Pooling data.Determination coefficient in the model shows that 41.6% of earnings quality changes are obtained from the independent variables of control variables and internal control quality standards.In Table 4-9 Coefficients correspond to the quality of internal control standard is -0.0562 ,On the other hand, the t-statistics for this index is -2.069.In fact, given that the significant level of the above variable is less than 0.05, the effectiveness of internal control quality criteria ($p-value$= 0.0391<0.05) and the operating profit (($p-value$= 0.00<0.05)) is significant.So with regard to the significance of the coefficient of internal control quality standards, we can conclude with confidence of 0.95, the second hypothesis "There is a significant relationship between the quality of internal controls and earning quality "is confirmed.

FINDINGS AND ANALYSIS

Hypotheses no.1: There is a significant relationship between the quality of internal controls and cash flow.

According to the results of the first research hypothesis stated that " Hypotheses no.1: There is a significant relationship between the quality of internal controls and cash flow."will be rejected with confidence 0.95.

Hypotheses no.2: There is a significant relationship between the quality of internal controls and earning quality.

So with regard to the material presented in chapter four with 0.95 confidence, we conclude that the second hypothesis that "There is a significant relationship between the quality of internal controls and earning quality. " will be accepted..

Practical recommendations based on the findings

It is recommended to the users of accounting information to consider the relationship between the quality of internal controls and the quality of earnings in its assessment in relation to the quality of the company's profits. Internal controls improves the quality of earnings .In other words, strong internal controls can be obtained at the company's strong management,

Therefore, investors and analysts can consider strong internal controls as one of the factors affecting the quality of earnings. Our finding shows direct evidence of a direct link between the quality of internal control and quality benefit which can considered in decisions being made by investors or analysis.On the other hand, the cash flow is not associated with weakness or lack of internal control, therefore it is recommended itis not been used in the following analysis on the quality of internal control because there is no meaningful relationship between them.

Suggestions for future research

Direction of the Science path is gradual and every research will create a basis for other researches. The study recommended some further researches that are presented as follows:

1) The study used only one measure of earnings quality. The future researches would use another measure of earnings quality or all measures of earnings quality in a comprehensive research.
2) Investigation of the relationship between the quality of internal control and stock returns.
3) Investigation of the relationship between the quality of internal control and audit quality.
4) Investigation of the relationship between the quality of internal control and capital costs.

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Table 1: The change calculation table

Variable	Type	The variable calculation method	Data	Reference
ICW	Independent	Variable is the quality of internal control derived from the report of the board of directors and audit reports. To assess the quality of internal controls, the report of the board in 2013 is used. In these reports, according to the mandatory legal of internal control evaluations of the Tehran Stock Exchange, Strengths and weaknesses of the system of internal control are reported by the Board of Directors of the company. Based on this report, the Company has two types of internal controls that are categorized as low quality and high quality segmentation. Companies with no weaknesses in internal controls are placed in first group while companies with significant weaknesses are placed in the other group.	Notes along with the annual financial statements of the listed companies in Tehran Stock Exchange	Financial statements and notes and Tehran stock exchange
TURN	Dependent	If the cash flow of the company in the next report is lower it will be "1" otherwise it will be zero.	Notes along with the annual financial statements of the listed companies in Tehran Stock Exchange	Financial statements and notes and Tehran stock exchange
DA :		It equals the quality of the company's profit that is calculated from the quality of accruals model consistent with the company's performance Discretionary model to calculate accrualsquality: $\frac{\Delta WC_{i,t}}{Assets_{i,t}} = \beta_0 + \beta_1 \frac{1}{Assets_{i,t}} + \beta 2 \frac{OCF_{i,t-1}}{Assets_{i,t}} + \beta 3$ $\frac{OCF_{i,t}}{Assets_{i,t}} + \beta_4 \frac{OCF_{i,t+1}}{Assets_{i,t}} + \beta_5 \frac{\Delta REV_{i,t}}{Assets_{i,t}} + \beta_6 \frac{PPE_{i,t}}{Assets_{i,t}}$ $+ \varepsilon_{i,t}$ Residual of above model represents quality so that the lower remaining amount shows the low earning quality and vice versa	$\Delta WC_{i,t}$:= $Asset_{t+1}$ -$Asset_t$)($OCF_{i,t}$:=) CFO_{t+1} - CFO_t($\Delta REV_{i,t}$:=($Sale_{t+1}$ - $Sale_t$). $PPE_{i,t}$:= (PPE_{t+1} – PPE_t) $Assets_{i,t}$:= ($Asset_{t+1}$ + $Asset_t$)/2	Financial statements and notes and Tehran stock exchange

Table 1: Omnibus test for the significance of the model

Chi square	Freedom degree	Significance level
8.114	7	0.323

Table 2: Estimation of the coefficient of regression model

	Coefficient estimation	Standard deviation	Wald estimate	Degree of freedom	Significance level	*Exp* (Coefficient)
Constant coefficient	.455	1.362	.112	1	.738	1.576
Internal control quality	-.077	.176	.189	1	.664	.926
Company growth	.000	.000	.233	1	.629	1.000
Operating profit status	.314	.305	1.061	1	.303	1.368
Auditor status	-.174	.209	.700	1	.403	.840
Company size	-.124	.140	.782	1	.377	.883
The number of board members	.053	.242	.047	1	.828	1.054
Independence of the Board of Directors	-.670	.319	4.400	1	.036	.512

Table 3: The summarized table of regression model fitting of the second hypothesis test

Variables	Coefficient	Standard Deviation	t	Significance level	Test Result
Constant coefficient	-0.064989	0.198334	-0.327672	0.7433	
Internal control quality	-0.056251	0.027183	-2.069335	0.0391	Significance
Company growth	-8.98E-06	4.87E-06	-1.844048	0.0659	
Operating profit status	-0.191018	0.042473	-4.497349	0.0000	Significance
Auditor status	-0.018611	0.031680	-0.587449	0.5572	
Company size	-0.004421	0.020740	-0.213185	0.8313	
The number of	0.031455	0.034961	0.899699	0.3688	

board members					
Independence of the Board of Directors	-0.080531	0.047634	-1.690618	0.0916	
The general results	Limer test		.662	F	27.602
	Significance level		0.988	Significance level	0.000
	Durbin–Watson statistic		2.43	The determination coefficient	0.416

Regression model:

$$DA = -0.064 - 0.0562 * ICW - 8.98E - 6 * GROWTH - 0.191 * LOSS - 0.0186 * BIGN - 0.0044 * SIZE + 0.0314 * BOARD - 0.0805 * IBOARD + \varepsilon_{i,t}$$

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RESEARCH ARTICLE

A Hybrid Data Mining Method to Improve the Detection of Spams in Computer Networks by Machine Learning Methods

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ABSTRACT

Based on increasing growth of access to internet and electronic documents, automatic classification of texts is of great importance. Automatic classification of texts is subject labeling of texts based on a pre-determined set. Texts classification is divided into two main sections of feature selection and learning algorithm. Various methods are presented regarding the feature selection techniques and learning algorithms. The aim of presented techniques is increasing accuracy of classification and achieving good efficiency. In this study, a hybrid method is presented acting on hybridoutput of classifiers. The proposed method is heterogeneous. The proposed method is implemented as hybrid by three algorithms of learning MNB, DMNB, and Random Forest and is evaluated. The results show the superiority of the proposed method by accuracy criterion as 99.55% and classification error as 0.45% compared to single algorithms and heterogeneous hybrid method.

Key words: Text mining, SPAM, Spam filtration, Feature selection, Learning algorithm

INTRODUCTION

Spam is one of the common and negative aspects of an e-mail address. Spams create many problems for cyber world. In addition, fraud problems challenge the security of cyber space. Detection of spam plays important effect on avoiding fraud and increasing safety in cyber space. To cope up with these techniques, various methods are proposed. One of the most important methods is classification of pages to spam and non-spam. One of the new ways of spam detection is using data mining algorithms based on spam content. The spams in Emails are not trash and as they include virus attachment and spy software, can be dangerous for a system and eliminate the information. Thus, we need some tools to detect spam. Many spam detection techniques are proposed based on machine learning

methods. As spam amount mostly is increased by great posting tools, we need some methods to detect spam and fight against it. By the increase of information in all fields, the people are much more dependent upon services in websites. For example, e-mails are the most rapid and economical way to communicate among people. The purpose of this study is : achieving a method for better detection of spams, presenting a hybrid method to increase efficiency of spams and identification and extraction of effective features for decision making regarding spam E-mails.

Theoretical basics

REVIEW OF LITERATURE

In Text Retrieval Conference of Spam Track (TREC) spam is defined as:

"Unexpected E-mails as sent from the sender directly or indirectly for the receiver as there is no relationship between them. Hidden motivation in spams is sending information to receiver including advertisement of a product (not valuable, illegal), fraud, promoting various reasons or sending bad software to steal computer information of receiver. Some of the features of spam are unexpected, unduly and fraud-based.

Spam is "unwanted E-mail, commercial and numerous E-mails received. To avoid these spams, spam detection models as classified into spam or non-spam are investigated in both groups. There are two methods of statistical and non-statistical. The problem with non-statistical methods in which there is no training to support the message with Look content and this leads to undetected spams and automatic response is given by system (Mubaid&Umair, 2006). Based on the above limitation, the researchers apply machine learning algorithms. One of the methods as applied widely is Bayes classifier. This method attempts to do the calculation as a message is spam or non-spam and based on features repetition (Arturo,2006). A considerable example is open text software Spam Bayes. Support Vector Machine (SVM) is used to detect spam (Azam&Yao,2012). Other famous learning algorithms to increase spam detection (Baoli et al,2003) and Artificial Neural Network (ANN) are used. These methods also include great costs based on heavy calculations and low detection rate and they don't use feature selection and irrelevant features are used (Bell et al,2005). Also, they don't optimize machine learning algorithm parameters. The aim of optimization of parameters is regulating the various parameters in machine learning algorithms to find their good value.

For example, weight and number of hidden layers in ANN, core function parameter of SVM [7] and also (Bi et al,2004) showed optimization of parameters in their algorithms but they didn't explain how optimized parameters are computed. In addition, they didn't use feature selection methods to detect spam. The aim of feature selection was finding about the irrelevant features as audit data features to reduce processing time and improving detection rate. All features are not necessary to understand whether an E-mail is legal or spam and irrelevant features not only increase calculation costs (e.g. time and resources), but also they reduce classification rate. In another reference (Bi et al,2004) performed feature selection but they didn't refer to how to select some important features and didn't provide the importance of variable of each of features as numerical value. Although they (Bi et al,2004) performed feature selection by feature ranking algorithm, their detection rate was very low.

In reference (Bi et al,2004), Mr. Porhashemi at first by combining N-gram and DF methods and making some changes performed pre-processing and then by combining feature selection , a two-level hybrid feature selection is created. Then, by various combinations of classifiers in single, single layer architecture and two -layer architecture, various states are compared for outputs of hybrid feature selection stage and the best states are selected. Their output was very exact and it showed the improvement of efficiency with hybrid algorithms (namely in feature selection stage).

In reference (Bisson,2008&Hussain), ABPNN method without the problems of BPNN algorithm like slow learning and involving in local minimum is used. In this method, three meaning similarity methods are used for spam filtering. At first a LSFS is used to reduce the dimensions and structure of latent meaning relation among the words to improve precision and efficiency of classifications and by instructional data set with a statistical method, by extraction of the relationship between the words based on their occurrence in texts and similarity of words, a data basis is formed (CBT) and finally the feature space is combined with database (HSS). The results are evaluated on LingSpam dataset.

In reference (Bryll et al,2003) based on logistic regression, a strategy is raised and the structure of each message is held in a Hoffman tree and a tree is assigned for each class. The words and their replication in message are held in the tree and feature vector encoding the information in tree. Then, the features are selected randomly among the features as applied recently and training model is given. This method is tested on Ling Spam dataset and it has high efficiency, stability and speed.

Study method

The main idea in this study is increasing efficiency and precision of classification by a hybrid classifier. The hybrid methods are as combination of features and combination of outputs. The proposed method acts on combination of classifiers of output with two advantages compared to the combination of features: First, in case of the increase of feature vector, it doesn't increase complexity of hybrid method and second, there is need to know the structure of classifiers and their feature vectors and they have less complexity. The idea is that multi-expert decision can be better than one-expert decision. in the proposed method, documents are pre-processed at first. In pre-processing stage, for uniformity of text, we convert all alphabets to capital alphabets to avoid any difference between upper and lower cases. Then, the entire text is turned into a series of separated words. This increases the dimension of features as each word in a text is considered a feature. In the next stage, we generated a new dataset with n-gram, 1,2,3. In the next stage, we weight the words. Weighting is performed by TF-IDF method. Then, the words have suitable weight based on their importance. In the next stage, feature selection is performed. As there are numerous features in text, we applied information gain filter feature selection. This reduces complexity of classification. Then, the test is one of the important features given to learning algorithm. In learning stage, instead of using a learning algorithm, three Bayes learning algorithms, decision tree and support vector machine are used as parallel. This increases efficiency of classification. Then, the combination of classifiers result is done by majority vote. In this method, a set is selected for document as giving more classifiers to it. The numbers of classifiers are odd and there is no need to re-voting in case of voting. The proposed method is supervisor classification and is tested on real data set. The results show suitable efficiency of proposed method. Finally, the efficiency of proposed method is investigated by various criteria. Based on the increase of efficiency by hybrid classifiers, in this study, a heterogeneous hybrid classifier are presented using majority vote method to combine the classifiers output.

Texts classification: If we have a set of D = {(d_1, y_1), … , (d_i, y_i), … , (d_n, y_n)}, as n is the number of texts and d_i = [w_{i1},…, $w_{i,k}$,…, $w_{i,|d_i|}$] is ithtext of this set, $w_{i,k}$ is kth word of ith text and y_i refers to a set of text (e.g. y_iC as C={c_1, c_2, …, $c_{|C|}$} is the set of sets or predefined in the system). The aim in texts classification is inference of a f relational function as y_i= f(d_i) or completely texts classification is determining a **boolean value** for each pair <d_j, c_i>D*C where, D is a set of texts and C is the set of pre-defined sets. T valued indicates that d_j text belongs to c_i set and F value shows lack of belonging of d_j text to c_i set .The aim i**s achieving estimation of :D*C**{T, F} function. Classification is implemented as three classifications of Binary Classification, Multi-Class Classification and Multi-Label Classification (Arturo, 2006). In binary classification, text document only belongs to one of two existing sets and classifier should attribute text document to one of the sets.

- In Multi-Class Classification, there are some sets in which text document belongs only to one of the pre-defined sets.
- Regarding Multi-Label Classification like Multi-Class Classification, there are various sets as a text document can belong to one or some of sets. We can say the sets can overlap each other.

Using machine learning techniques in texts classification: To classify the texts by machine learning techniques, some basic points should be considered:

- Determining the sets
- Providing data set for training and test
- Preparation and display of text documents
- Determining algorithm for learning

Texts classification stages: We can consider the main stages of classification process based on pre-processing, feature selection, classification and evaluation stage. In pre-processing stage, the input data should be converted as they can be processed in next stages. In pre-processing, the following operation is performed on operation input data: Separation of words, elimination of irrelevant words, words stemming, weighting the words (features). Feature selection refers to the selection of the features with high importance. Some of the main grounds of feature selection are : Detection of image, Bioinformatic, clustering, texts classification, monitoring of systems and inference rules (Jensen, 2005). Feature selection algorithms are classified based on evaluation method into filter and wrapper sets. If a feature selection algorithm works independent from each learning algorithm (a completed independent pre-processor), this called filter type. Indeed, redundant features are filtered before inference. If evaluation method is interwined with learning algorithm, feature selection algorithm follows wrapper method. It means that if we use learning algorithm as evaluation function (Dave, 2011; Eyheramendy and Madigan, 2005).

Learning algorithms: One of the methods and algorithms of machine learning for automatic classification of texts is : Bayes classification, decision tree, k the closest neighborhood, support vector machine, neural networks, Rocchio algorithm, genetic algorithm, etc. (Khanet al., 2010).

Support vector machine: It is one of the distinction-based classification methods with good results in classification problems. SVM classification method is based on minimizing risk of calculation learning theory. The idea of this principle is finding a hypothesis to guarantee the lowest error. In addition, SVM is very suitable for theoretical perception and analysis (Joachims, 1998).

Simple Bayes: Another algorithm in classification is simple Bayes. This method is of great importance for some reasons. Its construction is very simple, there is no need to repetitive parameter estimation plans. It is used in a wide data set. This algorithm is one of the rapidest algorithms in classification. For simplicity, we consider two sets as ranked i=0, 1. The aim is using a set of initial members with recognized set members to create a score. The higher scores with members of set 1 and lower scores with members of set 0 are associated. Thus, classification is achieved by comparing these scores with a threshold.

Decision tree: This tree is one of the most famous methods in classification. In decision tree-based classification algorithms, output knowledge is presented as a tree of various states of features values. Displaying knowledge as tree causes that decision tree-based classifiers are interpreted fully.

FINDINGS

Input documents

In this study, ling spam data set is used. The total documents are 2893, of which there are 481 spams and 2412 non-spams.

Pre-processing stage

To classify the texts after providing the data set, pre-processing stage is achieved. In this stage, raw text documents are turned into the form as applied in feature selection and learning algorithm. In pre-process stage of proposed method, Transform Case ,Tokenization,Filter StopWords,StemmingandGenerate n-gram operation is performed. The performance of each of them is defined as followings:

Transform Case: In this stage, all existing characters in text are turned into an equal form. In this stage, all characters are turned into lower case.

Tokenization: IN this stage, the entire test is divided as separated consecutive words.

Filter StopWords: In this stage, redundant words in English are removed.

Stemming: The stem of words in English is used by porter stemming algorithm to remove the suffixes and prefixes to reduce the length of words till they are transformed into the form of their stems.

Generate n-gram: In this stage, for indexing and reduction of dimensions, n-gram is used. By n-gram we can show the text as a series of consecutive words with n length. This model at first was raised for speech processing problems. Now, various studies of this model have been conducted for natural language processing and texts classification (Peng and Schuurmans, 2003; Furnkranz, 1998; Wei et al., 2009; Nather, 2005). Based on the tests on various n values and to avoid complexity, n-gram with n=1,2,3 is used. After the above stages, features weighting is performed. In this study, tfidf weighting is used and the classifier performance is evaluated by this weighting method (Lan and Tan, 2007).

Feature selection stage

Based on the feature selection methods and tests, according to the extracted results in various references and test of feature selection algorithms in this study, to increase efficiency and reduce complexity, selection of filter feature of information gain in feature selection stage can be used.

Learning stage

In combination state, majority vote is used, then evaluation is made and classification efficiency is investigated based on various criteria. To evaluate efficiency of proposed method, three classifiers and two algorithms of Bayes family as MNB, DMNB and decision tree Random Forest are used.

Evaluation stage

One of the most important sections in classification is classification model evaluation. In this section, evaluation criteria for texts classification are investigated (Sebastiani, 2002). The evaluation of a text classification model can be performed based on educational and test samples. For evaluation, the label that classification model assigns to text document or the label to which text document belongs is compared. The various stages for sets and documents are as followings:

TP: it indicates the number of samples as their real set is positive and their classification algorithm is assigned accurately to positive set.

FP: It indicates the number of samples as their real set is negative and their classification algorithm is assigned incorrectly to positive set.

TN=It indicates the number of samples as their real set is negative and classification algorithm assigns them correctly to negative set.

FN: It indicates the number of samples as their real set is positive and their classification algorithm is assigned incorrectly to negative set.

Generally, various evaluation criteria are presented as one of the most important examples is accuracy, precision, recall and F1 criterion (Sebastiani, 2002).

The most important criterion to determine efficiency of a classification algorithm is accuracy. This criterion computes total precision of a classifier. This criterion indicates which percent of total data set is classified accurately. Equation (1) shows the calculation method of accuracy criterion.

$$Accuracy = \frac{TP + TN}{TP + FP + FN + TN} \quad (1)$$

Two values of TN, TP are the most important values that should be maximized to maximize the classification efficiency. In texts classification, it is possible that there is no balance between the number of various sets samples, it is possible that a set has more samples than other sets. Thus, final model is directed to the set with highest sample. Thus, the set with low sample has no effect on improvement or non-improvement of efficiency. Accuracy criterion in data set with imbalanced sets with various samples is not a good criterion.

Classification error criterion is obtained by equation (2). This equation is opposite to accuracy criterion. The lowest value is zero (best efficiency) and highest value is one (lowest efficiency).

$$ER = \frac{FN + FP}{TP + FP + FN + TN} = 1 - \text{Accuracy} \quad (2)$$

Precision criteria show the percent of documents as classified accurately among all text documents as assigned by classifier to the set. IN other words, classification precision of set I based on total shows that label I is proposed for the investigated sample by classifier. The calculation method of this criterion is shown in Equation 3. Index i in these parameters means that parameters should be computed for each set of i.

$$Precision_i = \frac{TP_i}{TP_i + FP_i} \quad (3)$$

Recall criterion for a set is the percent of text documents as classified accurately among all documents belonging to the set. The precision of classification of set I based on total samples with label I is shown. The calculation of this criterion is shown in Equation 4.

$$Recall_i = \frac{TP_i}{TP_i + FN_i} \quad (4)$$

The important point is that Recall criterion shows the efficiency of classifier based on the number of occurrence of set i but precision criterion is based on precision of set prediction and it shows how much we can trust classifier output.

F1 criterion is obtained by combining Precision and Recall and it is used when we can not consider specific importance for each of two criteria of Precision and Recall. Equation 5 shows the calculation method of this criterion.

$$F1_i = \frac{2 * Precision_i * Recall_i}{Precision_i + Recall_i} \quad (5)$$

Methods evaluation

In this stage, the models are implemented and can be evaluated by raised criteria. The criteria include accuracy, classification error, precision mean, recalling mean and F1 average. All the results are based on percent.

Evaluation of simple method on SVM classifier

In this stage, to evaluate simple method in learning stage, SVM classifier is used. Table 1 shows the results of simple method by SVM classifier. The results show high efficiency of simple method by support vector machine classifier in precision mean as 99.10%, recall mean as 98.05% and F1 mean as 98.55%, accuracy criterion as 98.55% and classification error as 1.45%.

Evaluation of simple method on Naive Bayes classifier

In this stage, to evaluate simple method in learning stage, Naive Bayes classifier is applied. Table 2 shows the results of simple method evaluation by Naive Bayes classifier. The results of simple method by Naive Bayes classifier in precision average is 97.45%, recall mean 99.20%, F1 mean as 94.60%, accuracy criterion as 92.20% and classification error with 7.80%.

Evaluation of simple method on MNB classifier

In this stage, to evaluate simple method in learning stage, Naive Bayesmultinomial classifier is used. Table 3 shows the evaluation results of simple method by Naive Bayesmultinomial classifier. The results of simple method by Naive Bayesmultinomial classifier in precision mean is 97.65%, recall mean 98.95%, F1 mean as 95.75% and accuracy criterion as 98.95% and classification error with 1.05%.

Evaluation of simple method on DMNB classifier

In this stage, to evaluate simple method in learning stage, DMNB classifier is used. Table 4 shows the evaluation results of simple method by DMNB classifier. The results of simple method by DMNB classifier in precision mean is 99.45%, recall mean as 98.80%, F1 mean 99.10% and accuracy criterion is 98.80% and classification error 1.20%.

Evaluation of simple method on J48 classifier

In this stage, to evaluate simple method in learning stage, J48 classifier is used. Table 5 shows the results of simple method evaluation by J48 classifier. The results in simple method by J48 classifier in precision mean is 83.65%, recall mean 79.96%, F1 mean is 81.76%, accuracy criterion 92.58% and classification error as 7.42%.

Evaluation of simple method on Random Forest classifier

In this stage, to evaluate simple method in learning stage, Random Forest classifier is used. Table 6 shows the evaluation results of simple method by Random Forest classifier. The results of simple method by Random Forest classifier in precision mean are 98.65%, recall mean as 93.15%, F1 mean as 93.05%, accuracy criterion as 95.45% and classification error with 6.85%.

Evaluation of hybrid method of majority vote on three Bayes classifier

In this stage, to evaluate hybrid method in learning stage, three classifiers SVM,DNMB and MNB are used. Table 7 shows the results of evaluation of method by hybrid method. The results by hybrid method in precision mean is 99.55%, recall mean 99.20%, F1 mean as 99.85%, accuracy criterion as 99.20% and classification error with 0.80%.

Evaluation of hybrid method for majority on SVM, DNMB, RF

In this stage, to evaluate hybrid method in learning stage, three classifiers SVM،DNMB،RF are used. Table 8 shows the results of evaluation of hybrid method by hybrid method. The results of proposed method by hybrid method in precision mean is 99.30%, recall mean 99.30%, F 1 mean 98.85% and accuracy criterion 98.45% and classification error as 1.55%.

Evaluation of hybrid method of majority vote on NB, DNMB and MNB

In this stage, to evaluate hybrid method in learning stage, three classifiers of NB, DNMB and MNB are used. Table 9 shows the evaluation results by hybrid method. The results by hybrid method in precision mean is 99.15%, recall mean 97.95%, F1 mean 98.80%, accuracy criterion as 98.45% and classification error with 1.55%.

Evaluation of proposed method on three classifiers of DNMB،MNB andRandomForest with majority vote and reduction of feature

In this stage, to evaluate the hybrid proposed method in learning stage, three classifiers of DNMB،MNB andRandomForest are used. Table 10 shows the evaluation results of proposed method by hybrid method. The results of proposed method by hybrid method with feature reduction of 5 useful features to 75 useful features are reduced. The result is the highest efficiency with 60 features with accuracy criterion as 99.55% and classification error with 0.45%.

DISCUSSION AND CONCLUSION

This study aims to present a model for spam classification by which we can classify text documents with high efficiency. Spams classification is similar to texts classification with two main sections of feature selection and classification algorithm. Based on efficiency of filter methods among the existing methods of information gain is used in this study. Single classification algorithms can not increase classification efficiency mostly.

As it was said, one of the ways to increase classification efficiency is using a combination of classifiers. Using combinational classifiers increases the efficiency of classification by combining some single classifiers. In this study, a method is proposed acting on combining output of classifiers. The proposed method is homogenous and uses similar classifiers with different samples with an alternative of educational set. Then, to combine the classifiers output, majority vote is used. The proposed method by three classification algorithms is raised and is implemented and evaluated separately. Then, the above algorithms are implemented and evaluated separately. Finally, a heterogeneous combinational system is used to compare with proposed method and single algorithms. The results show the superiority of the proposed method by learning algorithm of DMNB ,RandomForest and MNB with accuracy 99.55% and classification error with 0.45% compared to classification by single algorithms and heterogeneous hybrid system.

Recommendations and Further studies

The model introduced in this study was a heterogeneous hybrid model. Regarding the feature selection and classification algorithm, the proposed model has good flexibility as for further studies, we can say researchers in feature selection stage can use filter algorithms as mutual information, correlation coefficient and probabilities and a combination of filter and wrapper algorithms as combination of algorithms as genetic algorithm with other filter algorithms and in learning stage, other cumulative algorithms as Adaboost not raised in this study.

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Table 1-The evaluation results of simple method by SVM classification

Set	Precision	Recall	F1
No spam	99.50	99.80	99.60
Spam	98.70	97.30	98.00
Average precision: 99.10			
Average recall: 98.05			
Average F1: 98.80			
Accuracy: 98.55			
Classification error: 1.45			

Table 2-The evaluation results of simple method by Naive Bayes classifier

Set	Precision	Recall	F1
No spam	97.10	99.60	98.30
Spam	97.80	84.80	90.90
Average precision: 97.45			
Average recall: 92.20			
Average F1: 94.60			
Accuracy: 92.20			
Classification error: 7.80			

Table 3- The evaluation results of simple method by Naive Bayesmultinomial classifier

Set	Precision	Recall	F1
No spam	99.70	99.10	99.40
Spam	95.60	98.80	97.10
Average precision:97.65			
Average recall: 98.95			
Average F1: 95.75			
Accuracy: 98.95			
Classification error: 1.05			

Table 4- The evaluation results of simple method by DMNB classifier

Set	Precision	Recall	F1
No spam	99.50	99.90	99.70
Spam	99.40	97.70	98.50
Average precision: 99.45			
Average recall: 99.80			
Average F1: 99.10			
Accuracy: 98.80			
Classification error: 1.20			

Table 5- The results of evaluation of simple method by J48 classifier

Set	Precision	Recall	F1
No spam	97.40	98.00	97.70
Spam	89.70	87.10	88.40
Average precision: 93.55			
92.55 Average recall:			
Average F1: 93.05			
Accuracy: 92.55			
Classification error: 7.45			

Table 6- The results of simple method evaluation by Random Forest classifier

Set	Precision	Recall	F1
No spam	97.40	98.00	98.60
Spam	99.90	86.65	92.30
Average precision: 98.65			
93.15 Average recall:			
Average F1: 93.05			
Accuracy: 95.45			
Classification error: 6.85			

Table 7- The results of hybrid evaluation method VOTE (SVM+DMNB+MNB)

Set	Precision	Recall	F1
No spam	99.70	99.90	99.80
Spam	99.40	98.50	99.90
Average precision: 99.55			
99.20 Average recall:			
Average F1: 99.85			
Accuracy:99.20			
Classification error: 0.80			

Table 8- The results of evaluation of hybrid method VOTE(SVM+DMNB+RF)

Set	Precision	Recall	F1
No spam	99.40	99.40	99.60
Spam	99.20	99.20	98.10
Average precision :99.30			
Average recall: 99.30			
Average F1: 98.85			
Accuracy:98.45			
Classification error: 1.55			

Table 9- Evaluation results VOTE(NB+DMNB+MNB)

Set	Precision	Recall	F1
No spam	99.40	99.80	99.60
Spam	98.90	97.10	98.00
Average precision: 99.15			
Average recall: 97.95			
Average F1: 98.80			
Accuracy:98.45			
Classification error: 1.55			

Table 10- Evaluation results VOTE(RandomForest+DMNB+MNB)

Set	Accuracy	Classification error
5 features	95.75	4.25
10features	97.15	2.85
15features	98.20	1.80
20features	98.75	1.25
25features	98.85	1.15
30features	98.85	1.15

35features	98.85	1.15
40features	98.90	20.
45features	99.15	.85
50features	99.10	.80
55features	99.25	.75
60features	99.55	.45
65features	99.15	.85
70features	99.30	.70
75features	99.35	65.

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RESEARCH ARTICLE

An Improving Transportation Model with Consideration of the Whole Supply Chain Management Based on Economic View

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ABSTRACT

In each economic activity, achieving maximum profit is final ideal and one of the effective factors on costs of all economic enterprises is transportation cost. Thus, in this stud y, an optimized transportation model is studied for main office of ports and marine of Bushehr by considering total supply chain with economic approach. In this model, objective function includes five type of costs as performance, maintenance of non-sent gods, transportation cost of sent goods and shortage costs and damage costs of shortage. 200 questionnaires including 20 questions are distributed among experts of main office of ports and marine of Bushehr city and their questionnaire is analyzed by SPSS software. All hypotheses are supported in Wilcoxon test and reliability of questionnaire is 0.832 by Cronbach's alpha and it shows good reliability of questionnaire. Finally, modeled parameters are considered. The outputs of presented model in GAMS software show that the presented model has important effect on reduction of objective function costs.

Key words: Supply chain, Transportation, Costs, Ports and marine, Wilcoxon test

INTRODUCTION

A survey of the development of trading shows simultaneous development of marine transportation. Efficient transportation increases international trade. Effective parameters on such transportation are affected by transportation rules and additional services as effective on transportation costs. The definition of a good transportation model is one of the concerns of companies dealing with suppliers and retailers. The development of transportation capacity with goods movement development has equal trend. Bushehr port as one of the important trade ports considers that import and export of most of commodities and container goods is considered after

Bandarabas in this port. This port is of great importance in economy and marine transportation. Some factors as shortage of machineries and equipment, access ways and shortage of space of port, etc. in loading and downloading port in Bushehr impose heavy costs on transportation system and supply chain and increase of goods price and services and reduction of efficiency and productivity of system in this commercial port. Presenting an improved model of transportation and total supply chain and with economic approach is the main purpose of this study. Each economic activity is performed to maximize profit and one of the most important costs on economic enterprises is transportation cost. Dealing with this issue namely in marine ports as one of the most important transportation ports of any country is necessary.

Theoretical basics

Effective supply chain management is one of the main factors of survival. Using IT in supply chain activities increases the potential of value creation in supply chain. Generally, supply chain management emphasizes on increasing adaptability and flexibility of companies and it has rapid response to market changes (Mianabadi, 2010). Supply chain management is the complementary result of warehouse management. By adding construction management, procurement and orders to distribution management, logistic concept is created and current condition, supply chain is the result of joining various operating loops as suppliers are at the beginning and customers at the end. A supply chain refers to materials, information , cash and information of services of suppliers of raw materials in workshops and warehouses to final customers and include organizations and processes creating goods, information and services and deliver to consumers. This chain includes many duties as purchase, cash flow, transportation, planning and control of production, inventory control and logistic and distribution and delivery. The goals of modern supply chain management software arereduction of uncertainty and risk in supply chain. Also, it affects the inventory, cycle, commercial processes and service providing to customer positively. One of the supply chain management goals is reduction of cost, increase of responsibility against customers, improvement of supply chain, reduction of cycle time of production and improvement of coordination. This chain is a dynamic process including simultaneous activities, continuous evaluation by involved sides, applied technologies and organizational structure.

The goal of this process is creating value for consumer (Poya, Alireza, 2005).

Global supply chains are encountered with similar risks in decision making threatening the system performance. Some risks as uncertainty in exchange rate, political and economic instability and competitive environment changes (Dornier, 1998).

Timely and complete relationship between all chain elements for the needs of customer and providing the needs are the necessities of chain. By using e-commerce in supply chain, supply can be the basis of B2E (Business-to- employee) and B2B (Business- to- Business) to describe purchase, sale and trading products, services and information via computer companies namely internet with suppliers (Mianabadi, Abasali, 2010).

In order to estimate the entrance time of transportation vehicles to required nodes, it is required to recognize in a definite distance of nodes, transportation vehicles of transportation companies to inform the agent of Transportation Company before they reach to the required node for loading and unloading. Among various methods applied for automatic detection of objects, image processing and Radio Waves are common to detect their entrance to specific domain (Isasi , Rodriguez , Armentia And Others ,2010).

Globalization of transportation in supply chain means transferring products from one place to another from the beginning of supply chain to delivery to customer. Transportation is the most important motivation of supply chain as the products as generated in a location are not consumed and their transfer is unavoidable. The role of

transportation in global supply chain is considerable and manufacturers can cover their global network. The international trade is growing and turned into the greatest global economic activity (Zadeh, 1978).

Population and statistical sample

The study population in this study is all experts of main office of ports and marine of province as 420. Based on the significance of study, the data collection is based on interview methods with managers, experts and questionnaire and documents in main office of ports and marine of Bushehr province. For sampling of required population, simple random method is used. In this study, all members of study population have equal chance for being selected. To determine the sample number, Kerjeci-Morgan Table is used and for sample size (420), 201 people are introduced.

Study hypotheses

We can present an improved math model of transportation as effective on improvement of economic condition of total supply chain.
By applied indices, we can achieve an efficient transportation model.
By improving transportation system, we can improve total supply chain.
By improvement in transportation system, we can reduce the costs.

METHODOLOGY

This study is applied in terms of purpose and descriptive-survey in terms of data collection. As productive transportation model components are investigated in population, it is descriptive and as in main office of ports and marine in Bushehr province is used for data collection, it is survey. To execute this applied study, it is required a math model is designed to improve current processes with economic approach. In the design of this model, besides considering transportation methods in Bushehr port, it is attempted to use the experience of other countries as adaptable with current processes of this port and improve the methods. In this study, we design a math model to investigate this model.

The required model is linear and with target function MIN as explained in another section of model.

In chapter 4 after questionnaire collection and required data regarding determined weights by experts and finally we present a consistent model.

Data collection measure

Among four types of techniques, interview, observation, questionnaire and documents, in this study based on the needs, observation, questionnaire and documents analysis are used. Documents resources include state information, media documents, state rules, personal information and adaptive information about other countries and international rules. The collection of a part of required information is performed by some methods and tools as personal observations, face to face discussions with specialists and domestic and international studies in this regard, internet world web, valid journals, lecturers of University and for data collection, a questionnaire is applied.

Reliability and validity of study

To increase validity of questionnaire, it is attempted to provide the questionnaire questions as simply and vivid according to experts. As the designed questionnaire is supported by experts. It has face validity. Based on content validity of questions by 20 experts, we can say it has content validity. To determine replication of questionnaire, there are many methods as: Split half, Koder, Richardson and Cronbach's alpha. In this study, to evaluate repetition of questionnaire, Cronbach's alpha is used. In this study, at first 20 questionnaires are distributed and then they are analyzed by SPSS software and alpha coefficient is 0.832 and good repetition is supported.

FINDINGS

Frequency distribution of degree of respondents:

The study findings show that 16% of study population is Diploma (32 statistical population) and 11% associate (22 people) and 46.5% BA (93 people) and 26.5% MA (53 people) and (0%)PHD (0 people of statistical population).

Frequency distribution of age of respondents

Among the respondents, people below 25 years, 1% (2 of study population), 35 to 35 years, 31.5 %(63 people).

35 to 50 years, 53% (106 people) are above 50 years, 14.5% (29 people).

Frequency distribution of work experience of respondents

Among respondents to these questions, people with less than 5 years of experience were 17% 934 people) and people 5-10 years 19.5% (39 people) and 10-15 years, 13% (26 people) and people above 15 years of experience 50.5% (101 people).

Frequency distribution of gender of respondents

Among respondents to this question, 93% were men (186 people) and only 7%(14 people) are women.

Kolmogorov-Smirnov test (K-S)

To determine normality of data, K-S test is used. This test is performed at significant level 0.05. P-value is smaller than 0.05 and variables are not normal and we can say to investigate effect of easy variables of application, innovation in presenting services and products and improvement of relations with customers, Wilcoxon test is applied.

Hypotheses of study

First hypothesis test

We can present an improved math model of transportation as effective on improvement of economic condition of total supply chain. H0, H1 are defined as follows:

H0: The improved transportation math model is not effective on improvement of economic condition of total supply chain.

H1: The improved transportation math model is effective on improvement of economic condition of total supply chain.

Second hypothesis test

By applied indices, we can achieve an efficient transportation model. H0, H1 are defined as followings:
H0: Applied indices are not effective on achieving an efficient transportation model.
H1: Applied indices are effective on achieving an efficient transportation model.

Third hypothesis test

By improvement in transportation system, we can improve total supply chain . H0, H1 are expressed as followings:

H0: Improvement in transportation system is not effective on total supply chain condition.
H1: Improvement in transportation system is effective on total supply chain condition.

Fourth hypothesis test

By improvement in transportation system, the costs are reduced. H0, H1 are expressed as followings:

H0: Improvement in transportation system is not effective on costs reduction.
H1: Improvement in transportation system is effective on costs reduction.

As shown in Table 5, all variables were effective according to the respondents as P-Value of them is higher than 0.05 and H1 is supported.

Model solution

The presented model in this study is a linear planning model as solved by Simlexalgorithm . The stages of solution of this model are performed by GAMS software and its coding is performed by entering the data of two Tables (suppliers data of raw materials for warehouse S) and (Customers information for warehouse g) as investigating the software output with the extracted Tables.

Parameters

To solve the presented model for transportation system of main office of ports and marine of Bushehr city, the data are collected to assign to model parameters. The data are provided via face to face visit and information resources in organization. For simplicity of model, the presented model parameters include number of products for investigation as only one product is assumed with the weight of 10kg and composed of three raw materials as a, b, foam with weights 5,3, 2kg. To transfer raw materials and products, boat and launch engines are used with load capacities 2500, 4000kg, respectively. The number of raw materials suppliers to provide raw materials, 5 companies areconsidered and required warehouses for final product are 8 warehouses and they are introduced in the following Table. For existing limitations in the presented model, definite values are defined and the capacity of raw materials warehouse

and final products are defined and the mean of waiting time for loading and in system are computed. The results of executed model are achieved by GAMS software for decision variables and each of them is defined.

The number of raw materials suppliers to provide raw materials of 5 companies is based on Table 6. The number of required warehouses for final product are 8 warehouses as introduced in Table 7.

Explanation

In unloading ports of Bushehr, some floats with various capacities are docked. To simplify the problem, two samples of common vehicles are considered and based on their size in small or big scales are used. For existing limitations in the model, definite values are defined as the capacity of initial warehouses and final products is defined and the mean of waiting time for unloading and in system are calculated.

Findings

By achieving the results of executed model by GAMS software for decision variables, the following values are achieved as:

dhi_s:The amount of held product in warehouse s

In Table 8, the held product amount in warehouse s is computed based on output for 8 required warehouses for products and the lowest product is in warehouse No. 6 with 329 and highest in warehouse NO. 5 with 2468 products and shows the highest amount of product in this warehouse.

dhr_g::Amount of held raw materials in warehouse g

In Table 9, the amount of held raw materials in warehouse g based on output for 5 warehouses for raw materials can be computed and the lowest raw materials in warehouse 5 with 148 and highest in warehouse 2 with 2458 products are shown.

dhr_{rg}:Amount of held raw materials in warehouse g

In Table 10, the raw materials held in warehouse g for raw materials r is computed based on output for 5 warehouses and the extracted result is explained in the followings.

For a raw materials, the lowest raw materials in warehouse No. 4 is 225 and highest raw materials in warehouse 1 with 2581 products. For raw materials b, the lowest raw materials in warehouse No.2 with 66 products and highest in warehouse 5 with 2698 products. For raw materials c, the lowest raw materials in warehouse 5 with 122 and highest in warehouse 4 with 2168 products.

The entrance rate of launch and boat vehicles to product warehouses

In Table 11, entrance rate of launch vehicles to held product warehouses shows that in warehouse 6, 0.9 and the highest rate in relation to entrance of launch vehicle to this warehouse is shown. As shown, for other warehouses, car entrance rate was less.

In another part of Table, entrance rate of boats to held product warehouses is shown and in warehouse No. 4, 0.9 and highest rate regarding boat entrance to this warehouse is shown as indicating considerable figure compared to other warehouses.

The entrance rate of launch and boats to raw materials warehouses

Table 12 shows the entrance rate of launch engine to raw materials warehouse and for Warehouse NO. 5, 0.6 is shown in this vehicle. The entrance rate of boat to raw materials warehouse is shown and in warehouse 1, 0.9 is higher than other warehouses.

Explanation

$\lambda g, \overline{\lambda_g}$ are entrance rates of transportation machineries to raw materials warehouses.
λs ، $\overline{\lambda_s}$Entrance rate of machineries to products warehouse .
Also, entrance rate to system for unloading in origin and destination is shown.

The number of waiting vehicles in system to achieve destination to products warehouse

Table 13 is divided into two parts. The above part is regarding the number of cars (launch engines) waiting in system to achieve destination as associated to warehouse 7 and 9 cars and a few cars wait in other warehouse.

In lower part of Table 13, number of waiting cars (boats) in system to achieve destination with their waiting time is shown and the highest number of cars for warehouse 8 and 7 cars.

The number of waiting cars in system to achieve destination to raw materials warehouse

In Table 14 for upper part of table for warehouse G, the number of launches waiting in system to achieve destination with waiting time are shown and the highest is for warehouse NO. 5 and 7 cars.

In lower part of Table 14, boats waiting in system to achieve destination with waiting time are shown. The highest is dedicated to warehouse 4 and 9 cars are shown**.**

The number of waiting cars for unloading of warehouse of products

In the upper part of Table 15, launch waiting for warehouse and product S with waiting time can be seen. The highest is dedicated to warehouse 6 and 9 vehicles are shown and these cars are more than waiting cars compared to other warehouses.

In the lower part of Table 15, regarding waiting time for unloading of products warehouse of boats for warehouses 4, 5, 9 cars are observed and these cars show considerable for this warehouse compared to other warehouses.

lq_g **and** lq_s: The number of waiting cars for raw materials warehouse

In the upper side of Table 16, the number of waiting cars to achieve unloading of raw materials warehouse can be observed and the highest queues is dedicated to the length of 9 launches for raw materials warehouse NO. 5 and compared to other warehouses, many cars are in the queue.

In the lower part of Table 4-54 for boats waiting, for warehouse No. 2, there are only 8 cars and compared to waiting cars in raw materials warehouse, It is one lower than launch engine cars and some of the waiting cars for this warehouse are high compared to other warehouses.

IN the lower part of Table 16 for boats waiting, for warehouse NO. 2, there are only 8 cars and compared to waiting cars in raw materials warehouse, it is one less than launch engine cars. Some of the waiting cars for this warehouse are high compared to other warehouses.

Summary

At the beginning of this section, study method is evaluated. At first, type of study is defined in terms of method and then study population and its features, Sample size and sampling method, data collection, reliability and validity and statistical methods are explained in details.

In this chapter, by the presented model, SPSS, GAMS softwares, outputs of objective function and decision variables are achieved and the obtained values are mentioned in relevant Tables as separated. These results show us solutions to improve system and it is also summarized.

CONCLUSION

After the presented model output in this study, the following results are achieved.

Based on transportation costs between company warehouses and maintenance costs and warehousing, we can say the presented model to improve costs has taken a big step. Also, the transportation costs of company are reduced to 16%. This cost reduction is due to optimization of queue system in warehouses.

By analysis of sensitivity of software outputs, we can say transportation costs are the most effective factor on costs increase. Then, maintenance costs and waiting costs can be effective on costs reduction.

By optimization of transportation system, delay cost of cars in waiting of loading are reduced and transportation system can be easier and no delay is seen.

This point that type of vehicle for transportation has any effect on transfer costs or not is not mentioned and this is due to lack of prioritization of required vehicles in case of any indifference to vehicle, orders capacity determines type of car.

In supply chain network of organization, with 5 raw materials warehouses and 8 warehouses for final products, a total system for transportation management between warehouses, by following factors can be presented.

- Transportation vehicles and capacity
- Waiting time for loading
- Waiting time for unloading
- Presence times in system

Totally, we can say optimization systems of transportation besides considering time and cost focus on comprehensibility and coverage of supply chain networks and by the presented model, besides coverage of all suppliers and buyers, transportation costs are reduced.

In addition, in this study due to using queue theory in raw material warehouses and products warehouses, the model output is as the lowest queue is created and costs of waiting time are reduced.

Finally, we should say the model of this study is close to the system and by considering all conditions, a comprehensive model is presented to fulfill the study objective as improved model of transportation by considering total supply chain management based on queue theory.

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Table 1- Frequency distribution of degree of respondents

Cumulative frequency percentage	F%	F	Items/question
16.00	16.00	32	Diploma
27.00	11.00	22	Associate
73.50	46.50	93	BA
100.00	26.50	53	MA
100.00	0	0	PhD
	100	200	Total

Table 2- Frequency distribution of age of respondents

Cumulative frequency percentage	F%	F	Items/question
1.00	1.00	2	18-25 years
32.50	31.50	63	25-35 years
85.50	53.00	106	35-50 years
100.00	14.50	29	Above 50 years
	100	200	Total

Table 3- Frequency distribution of work experience of respondents

Cumulative frequency percentage	F%	F	Items/question
17.00	17.00	34	Less than 5 years
36.50	19.50	39	5-10 years
49.50	13.00	26	10-15 years
100.00	50.50	101	Above 15 years
	100	200	Total

Table 4- Frequency distribution of gender respondents

Cumulative frequency percentage	F%	F	Items/question
93.00	93.00	186	Man
100.00	7.00	14	Woman
	100	200	Total

Table 5-Wilcoxon test

Support or reject	P	Wilcoxon statistics	N	Variable
Supported	0.879	32379.0	200	First hypothesis
Supported	0.995	29029.0	200	Second hypothesis
Supported	1	50895.0	200	Third hypothesis
Supported	0.964	41092.0	200	Fourth hypothesis

Table 6- The table of suppliers information (warehouse of raw materials G) warehouse of sending

Time in queue	Path time	Demand	**Warehouse capacity**			Ware house name Supplier	**N**
			c.Foam	b	a		
1	25	100	535	54	55	Company (1)	1
3	36	150	625	42	22	Company (2)	2
9	15	150	615	41	51	Company (3)	3
0	27	100	445	51	44	Company (4)	4
6	22	150	520	41	62	Company (5)	5

Table 7-The table of information of customers of warehouse S (reception warehouse)

Waiting time	**Path time**	**Demand**	**Warehouse capacity**	**Name of warehouse of customers**	**No**
5	25	100	750	Warehouse(1)	1
8	16	150	845	Warehouse (2)	2
9	25	150	555	Warehouse(3)	3
5	17	100	750	Warehouse(4)	4
6	26	150	140	Warehouse (5)	5
6	27	100	745	Warehouse(6)	6
6	15	150	950	Warehouse (7)	7
8	34	120	443	Warehouse(8)	8

Table 8-The amount of held product in S warehouses

1478	s=1	dhis
1320	s=2	
752	s=3	
469	s=4	
2468	s=5	
329	s=6	
992	s=7	
1422	s=8	

Table 9-The raw materials held in G warehouses

1245	g=1	dhrg
2458	g=2	
225	g=3	
459	g=4	
148	g=5	

Table 10- The amount of raw materials held in warehouse S for raw materials r and a,b,c raw Materials

857	r=c	662	r=b	2581	r=a	g=1	dhr_{rg}
354	r=c	66	r=b	324	r=a	g=2	
541	r=c	692	r=b	541	r=a	g=3	
2168	r=c	656	r=b	225	r=a	g=4	
122	r=c	2698	r=b	969	r=a	g=5	

Table 11- The rate of entrance of launch and boat vehicles to held products warehouses Boatlaunch engine

0.4	s=1	$\overline{\lambda_s}$
0.6	s=2	
0.4	s=3	
0.9	s=4	
0.5	s=5	
0.4	s=6	
0.7	s=7	
0.2	s=8	

0.5	s=1	λ_s
0.8	s=2	
0.5	s=3	
0.2	s=4	
0.3	s=5	
0.9	s=6	
0.4	s=7	
0.1	s=8	

Table 12-The entrance rate of launch and boat to raw materials warehouse Boat Launch engine

0.9	g=1	$\overline{\lambda_g}$
0.4	g=2	
0.6	g=3	
0.3	g=4	
0.7	g=5	

0.1	g=1	λ_g
0.5	g=2	
0.2	g=3	
0.2	g=4	
0.6	g=5	

Table 13-The number of waiting vehicles in system to achieve destination

3	l=1	s=1	
4	l=1	s=2	
7	l=1	s=3	
5	l=1	s=4	
6	l=1	s=5	
3	l=1	s=6	
9	l=1	s=7	
3	l=1	s=8	

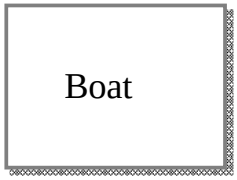
4	l=2	s=1	ls_s
1	l=2	s=2	
4	l=2	s=3	
6	l=2	s=4	
5	l=2	s=5	
2	l=2	s=6	
1	l=2	s=7	
7	l=2	s=8	

Table 14-The number of waiting cars in system to achieve destination

2	l=1	g=1	
3	l=1	g=2	
5	l=1	3g=	
4	l=1	4g=	lg_g
7	l=1	5g=	
5	l=2	g=1	
3	l=2	g=2	
3	l=2	3g=	
9	l=2	4g=	
3	l=2	5g=	
			lg_g

Table 15-The number of waiting cars to achieve the period for unloading warehouses S

4	l=1	s=1	
7	l=1	s=2	
2	l=1	3s=	
3	l=1	4s=	
1	l=1	5s=	
9	l=1	s=6	
4	l=1	s=7	
4	l=1	s=8	lq_s
8	l=2	s=1	
5	l=2	s=2	
3	l=2	3s=	
9	l=2	4s=	



9	l=2	5s=	
1	l=2	s=6	
4	l=2	s=7	
3	l=2	s=8	

car

Table 16-The number of waiting cars for raw material warehouses

3	l=1	g=1	
4	l=1	g=2	
5	l=1	g=3	
7	l=1	g=4	$l_{4,g}$
9	l=1	g=5	
3	l=2	g=1	
8	l=2	g=2	
3	l=2	g=3	
3	l=2	g=4	
6	l=2	g=5	

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RESEARCH ARTICLE

Studying the Relationship between Credit Risk and Profitability and Liquidity of Banks Operating in Tehran Stock Exchange; Evidence from Iran

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ABSTRACT

The main objective of this study is to investigate the relationship between credit risk and profitability and liquidity banks listed in Tehran Stock Exchange for period of 2009-2013. The research is applicable and research method is deductive and analytical. Theoretical bases are extracted from relevant articles by library method. The study hypotheses are tested on the basis of panel data method. For this aim, the empirical model is estimated by econometric tests and using panel data. In this paper, credit risk is as dependent variable and profitability measures (Return on assets, return on equity, net profit margin) and liquidity (loans to deposits ratio, total debt to equity ratio) are considered as independent variables and firm size (Bank) is considered as control variable. Examining the model in terms of constant or variable effects and estimating Hausman test, the results showed that there is negative and significant relationship between variations of return on assets rate, return on equity, net interest margin and changes in credit risk; there is significant and positive relationship between variations of total debt of banks to total equity of banks ratio and changes in banks' credit risk; also, the effects of loans to deposits ratio and firm size to banks' credit risk is non- significant.

Key words: Profitability, Liquidity, Credit Risk, Banks of Iran.

INTRODUCTION

Banks as intermediaries of funds as well as investment institutions such as securities and insurances are considered as main pillars of financial markets. Banks are important factors of monetary policies and executives for central bank's economic decisions. Banks play an important role in regulation of economic sectors through contraction and expansion of bank credit and directing funds from department to department and help to stabilize the economy in Macroeconomics. Banking is more important in Iran because of necessary capital market absence in Iran economy and in practice, these banks are responsible for long-term financing (Shadkam, 2014). Banks can be considered as driving force behind other sectors in country economy that facilitate trade and commerce through leading and organizing inputs and outputs and lead to economic expansion and markets growth and prosperity (Mousavi et al., 2013). In other words, banks have a mediating role between lender and borrower. Obviously, the main aim of a bank or any other financial department is to increase its value, in addition to fulfilling social responsibility. Bank is a commercial organization that is created in order to obtain profit from credit and monetary transactions, from founders and shareholders point of view. This group believes that bank managers must realize maximum benefits. Therefore, examining the relationship between credit risk, profitability and liquidity of banks listed in Tehran Stock Exchange is now regarded as a requirement due to the expansion of bank branches and growing private banks and financial and credit institutions nationwide and presence in competitive market (Owni, 2011).Today, the service sector constitutes a significant share of economy compared to two other sectors of economy (industry, agriculture), and banks and financial and credit institutions play excellent role in service sector. Any activity that involves the acquisition of capital and financial resources, with no doubt needs the involvement of banks and financial institutions. Banks form important and effective part of worldwide economic and commercial activities. Most individuals and institutions use banks for deposit or borrow. Banks play main role in maintaining public confidence in monetary system through their close relationship with regulatory authorities and governments as well as government regulations that are imposed on them. Thus, there is considerable interest in financial health of banks, particularly the ability to pay obligations, cash flows, and relative risks (hazard) towards various functions (AliMadad, 2013). Therefore, the main objective of this study is to investigate the relationship between credit risk and liquidity and profitability of banks listed in Tehran Stock Exchange.Measuring profitability and liquidity of banks may be very important for public and private banks. If we accept that many variables including customers, employees create profits not products, in this case, the banks need analyze profitability in order to organize their relationship with customers. The profitability is effective factor in assessing performance of all banks. Since profitability is one of the important functions of banks as financial intermediaries and since the profitable bank has more power to deal with negative markets, therefore, considering credit risk and liquidity is essential as factors affecting the profitability of banks and the importance of its role in decisions related to mobilization of resources, financing as well as resource allocation. Therefore, banks must increase competitiveness ability and adaption with changes of macroeconomic environment through examining factors related to profitability. Since banks are business enterprises that have been created to obtain profits through monetary and credit transactions and short-term and long-term loans, we try to understand which factors are used for profitability and what is banks' role. Assessment of credit risk and liquidity of banks are considered in order to achieve this objective.The general aim of this research is to study the relationship between credit risk, profitability and liquidity of Banks listed in Tehran Stock Exchange. Secondary objectives include identifying the relationship between credit risk and return on assets rate, return on equity, net profit margin, and loans to deposits ratio and total debt to equity ratio.

Theoretical Research and Literature Review

Theoretical Research

Effective factors on banks profitability: Some factors affecting the profitability of banks under the control of management include:

Capital: capital in economy is right or interest of institution owners on institution assets. The amount is obtained through subtracting institution liabilities from total assets (Nabavi, 2011). One reason for high ratio of banks' capital is to enable them to counter the risk of non-repayment by credit borrowers, because bank uses its own capital as a buffer against bankruptcy (Ahmadzadeh et al., 2013). Adequate and sufficient capital is requirement in order to protect banking system health and each bank and credit institutions must set good ratio between capital and risk of assets in order to ensure the stability and sustainability of their activities. For this aim, one considerable index is ratio of banks and financial institutions' capital adequacy (Shabahang, 2011).

Credit risk management: Credit risk is the probability of bank resources' non- return by debtors; banks face these risks when debtor does not pay his commitments to bank due to lack of ability or willingness. In calculating credit risk, the ratio of total past due maturities, overdue, doubtful maturity, reserving doubtful maturities to total basic facilities, total loans provided to hundreds of superior customers to total loans and total hundreds of major facilities to total facilities are used. (Nabavi, 2011)

Liquidity: Liquidity is the ability of bank access to cash in order to meet necessary or current needs. Banks need to have sufficient liquidity in order to meet the demands of depositors and borrowers so that attract the public trust. Therefore, financial institutions need to have assets management system and effective liabilities in order to minimize maturity mismatch of assets and liabilities and optimize their return. Also, creating appropriate balance between liquidity and profitability is important due to the inverse relationship between these two factors (Ahmadzadeh et al., 2013).

Cost Management: The ultimate aim of any business firm is to increase the value for shareholders. In fact, in new business conditions, firms' sustainable success depends on value creation for shareholders; since shareholders invest there that gives the expected return. There are several ways to increase profitability and value creation for shareholders. Although, creating an appropriate capital structure and improving firm's portfolio is the most common action to increase value, another important benefit origin is to apply cost management by different units (Fakharian, 2014).

Facilities: Granting credit facilities is the main areas of activity and the main source of income for many banks. Economic growth is not possible without increasing capital factor quantitatively as production factor and since it is not possible for all parties for various reasons to use their personal money and monetary resources to meet the needs during all stages of activities and besides receipts and payments of economic units rarely match, then they tend towards financial and credit institutions that banks are the most important of them in order to use facilities and resources (Hedayati et al., 2010)

Liquidity Management Theories

Credit risk is one of the most common risks that banks face and proper liquidity management is necessary in order to prevent the loss of investment opportunities, to use excess amount of liquidity for investment and lending new facilities to earn higher returns and to be ready to face crisis and shortage of cash. It is necessary for proper management of liquidity to identify effective tools and factors. One of the most important and effective factors on banks' liquidity is position of bank assets and liabilities.) On the other hand, assets- debt management is one of the key factors in explaining the financial sustainability of banking and economy sector (Jaiswal and Ritter, 2010). Assets-debt management is an attempt to match assets and liabilities in respect of debt maturities and their sensitivity to interest rate and credit risk and interest rate essentially stem from such an absence (Mohapatra and Chakraborty, 2009). Liquidity management means forecasting the demand size for funds by public and ensures adequate funding for these needs in the forms of withdrawal of deposits and demand for credit. In the case of liquidity management, the following theories have been proposed:

Commercial Loans Theory: Overdue loans meet bank needed liquidity automatically. According to this theory, the best type of investment and credit is facilities and short-term investments (Woodworth, 1999).

Shiftability Theory: Its proponents argue that Banks must maintain a significant amount of their funds in the form of short-term first grade and negotiable securities. In the event of a liquidity problem for banks, these securities can be sold without significant losses (Rose, 1999).

Anticipated Income Theory: Proponents of this theory believed that most commercial and consumer loans have been granted for collection of revenue flows. The huge flow of credit accounts receipts provided continuous funds for banks in order to meet liquidity needs and demand for new facilities (Woodworth, 1999).

Liability Management Theory: Proponents of this theory argue that liquidity requirements must not be stored in bank. Whenever the liquidity is needed, liability management may obtain or purchase it from market (Woodworth, 1999).

Theory of Asset - Debt Management: Banks met their needed funds mostly from demand and short-term deposits since the end of World War II until the early 1960s. In such situations, the management of bank funds focused on controlling all assets and banks had two sources of funds including major deposits and purchased funds (EqtesadNovin Bank, 2013). Six of balance-sheet accounts that are associated with cash flows include liquidity, deposit liabilities, long-term investments and facilities, long-term commitment and capital, non- cash short-term assets and non- deposit short-term liabilities. From these accounts, bank can only control some of them in short-term such as non- cash short-term assets and short-term deposit liabilities (Arab Mazar and Ghanbari, 2014).

LITERATURE REVIEW

In Iran researches, the results of Asadipour study (2014) entitled "Reviewing strategies to increase profitability in banking system" where bank performance has been studied over 12 years showed that prescribed and short-term facilities effect adversely on profitability and there is a positive relationship between short-term deposits and profitability. In a study by Bagheri (2013) in Refah Bank period between 2010 to 2012 entitled "A study of factors affecting the profitability of commercial banks", the findings suggest that efficient management of costs, assets, liquidity and capital management among internal factors and economic growth among external factors have significant positive correlation with profitability and inflation effects reversely on profitability with lower significancy. Kimiyagari et al (2012) in a study entitled "Credit risk model related to repayment of bank consumers' credit facilities (case study of Shahreza Bank)" studied on a sample of 31 firms that received credit facilities during 2007- 2011 from National Bank of Shahreza using logistic regression analysis. In this work, 28 variables were selected that were important in terms of banking system and experts in this field, and 15 main variables were selected after qualitative and quantitative separation, and creating a table all information was obtained and results based on relationship between customers and repayment were obtained using SPSS software. Also, Ahmadian (2012) in a study entitled "Management of credit risk in the banking system of financing challenge" aimed to formulate a model to reduce gaps between banking system and finance sector, studied on the challenges from perspective of banking system on the one hand and enterprises on the other hand. Finally, they provided operational strategies to reduce the gaps between banking system and private sector in improvement of financing process. Armashi (2014) in his MA thesis studied on the relationship between credit risk of customers and some financial and demography variables. After estimating the model, the following results were confirmed: gender, income, residence type, marital status, age and professional status of customer variables effect on probability of loans non- repayment but income variable effects negatively. Loan size and repayment period variables are ineffective. The results of research conducted by Ashrafzadeh and Mehregan (2013) entitled "Management of credit risk in the banking system of financing challenge" during 2005- 2012 showed that profitability is directly related to profit margin and economic growth rate and

inversely related to inflation rate. Positive relationship between profit margin and profitability according to profit margin definition indicates a direct relationship between interest rate of bank facilities and profitability, and indicates an inverse relationship between deposit interest and profitability.

Also in a study by Sheri and Naderi (2014) entitled "Relationship between macroeconomic factors and credit risk banks" that examines the profitability of Tunis in 10 main deposit bank during 2000 to 2013, results show that among high capital internal factors, overhead costs and bank lending rates granted to customers effects directly on profitability and among the indicators of financial structure, the focus effects less and positively on bank profitability and net profit margin compared to free competition and development of stock market indicator has a positive effect on bank profitability. This shows the dependence of stock market and banking development and government non-intervention in banking industry is compatible with profitability of this sector. In a another study by Athanasoglou and Thaler(2008) the results showed that there is positive relationship between investment, productivity growth, cost management and profitability variables and variables of size and ownership have little effect on profitability of banks. Also, Castro (2013) performed a study entitled " Macroeconomic determinants of the credit risk in the banking system: The case of the GIPSI ". In this study, the relationship between macroeconomic developments and bank credit risk was studied in countries: Greece, Ireland, Portugal, Spain and Italy. The findings of this paper suggest that all political measures that can be used to promote growth, employment, productivity and competitiveness and to reduce public and foreign debt of these countries are necessary to stabilize their economy. Also Silva et al., (2013) conducted a study in Brazil entitled "The role of banking regulation in an economy under credit risk and liquidity shock ". The results showed that credit risk is periodic and default risk depends on structural characteristics. The bank policymakers can reduce fluctuations in output through setting policies to promote financial stability and efficiency. A study was conducted by Kasman et al (2011) entitled "The impact of interest rate and exchange rate volatility on banks' stock returns and volatility" where effective factors on profit of 23 Greece banks during 2002 to 2010 have been investigated. The results prove that asset quality factor effects positively and significantly on bank's profitability. In the case of entering bank specific variables, size factor will affect less, and in the case of entering macro and financial market structure variables, size will affect significantly and positively on bank profitability. Paolo (2011) conducted a study entitled "Determinants of the Profitability of the US Banking Industry" and showed that non-default risk probability in future is subject to increased profitability, liquidity, cover, activity and reduction of leverage.

The Research Variables

In this paper, the credit of banks risk listed in Tehran Stock Exchange is used as dependent variable and information of private banks have been used in this case. The firm size and capital structure have been considered as control and independent variables.

Studying durability and non- durability of model variables

According to durability test results, it was found that two variables of firm size and return on assets rate and return on net profit are at durable level and remaining variables of model are not at durable level. According to these results, subtracting the first rank of these variables, the null hypothesis is rejected and variables are significant at level 1. Thus, in addition to firm size variable and return on assets rate and net profit margin, other variables related to banks of this study have a unit root, therefore, they are durable from first rank (1) I. In the following table, we can see test results of model variables durability.

Studying Pedroni Co integration Test

According to the results of high durability tests, Co integration tests are used because of non- durability of some level variables. According to standard normal distribution of two statistics, results are compared with critical value of -1.96

in accordance with the following table. According to results, in studied banks, the obtained absolute numbers of this study are higher than 1.96. The null hypothesis is rejected based on lack of co integration relationship between variables. Accordingly, there is long-term relationship between variables of reviewed banks.

Table 2. Co integration test results for selected banks of this study

Studying the fixed effects of model Results

The third step of model estimation reviews and evaluates the tests that are done in order to determine the type of panel model. Models that fall in this category can be panel model or pooled model. For this purpose, fixed effect test can be used in order to detect panel or pooled models. Here the F statistics related to pooled regression versus non-pooled regression are calculated using sum of residual squares or determination coefficient.

Statistical hypotheses of these tests are as follows:

H_0: Intercept of all banks are equals (all fixed effects equal to zero) -Pooled Model.

H_1:: Intercept for at least one of banks differs from other banks- Panel Model.

In this study, F test provided by Wooldridge or Green is used in order to study on presence of fixed effects;

Firstly, pooled regression and regression with fixed effects are estimated and F statistic is calculated using sum of residual squares. If the null hypothesis is established, the panel regression model with the equal parameters are estimated and specified as compound regression model that is called pooled model. While, if the null hypothesis is rejected, the model is called panel and in this model, the dependent variable behavior pattern will be different for different banks. Test sample function is defined as below. Pooled model regression residuals are used to determine the statistics and LSDV residuals are used for fixed effects regression model. If the calculated F value based on above equation is larger than table F value with degrees of freedom (N-1) and N (T-1) –K, null hypothesis is rejected; otherwise, the null hypothesis is accepted.

$$F = \frac{(e_r^* e_r - e_u^* e_u)/(N-1)}{e_u^* e_u/(N.T-K-N)}$$

In above equation $e_r^* e_r$ is Sum Squared Resid of pooled model; $e_u^* e_u$ is Sum Squared Resid of non- pooled model (LSDV),

N: number of sections (banks),
K: number of descriptive variables,
T: number of time periods.

The results of this test are provided in table below.According to the results of F test, it has been shown that calculated value of F statistic is equal to 89.19 and is significant; therefore, the null hypothesis is rejected based on the fact that panel models are pooled in favor of being panel. Thus, we can conclude that each bank has its own intercept and considering only one intercept for all banks is not suitable. Therefore, considering the values obtained for F statistics, it can be said that The Fixed Effects Model (FEM model) is preferred to Pooled model of this study.

Hypotheses

According to objectives of study the research hypothesis are as follows:
Hypothesis 1: There is a significant relationship between credit risk and liquidity and profitability of banks listed in Tehran Stock Exchange.
Hypothesis 2: There is a significant relationship between credit risk and rate of banks' return on assets.
Hypothesis 3: There is a significant relationship between credit risk and banks' return on equity.
Hypothesis 4: There is a significant relationship between credit risk and banks' net interest margin.
H5: There is a significant relationship between credit risk and loans to deposits ratio of banks.
H6: There is a significant relationship between credit risk and debt to equity ratio of banks.

Studying random and non- random effects model

We can study on random effects model versus pooled effects based on Breusch and Pagan (1979) LM test. This test is based on residuals of pooled model. The test is as follows:

$$LM = \frac{NT}{2(T-1)}\left[\frac{\sum_{i=1}^{N}[\sum_{t=1}^{T} e_{it}]^2}{\sum_{i=1}^{N}\sum_{t=1}^{T} e_{it}^2} - 1\right]^2 = \frac{NT}{2(T-1)}\left[\frac{\sum_{i=1}^{N}(T\bar{e}_i)^2}{\sum_{i=1}^{N}\sum_{t=1}^{T} e_{it}^2} - 1\right]^2 \approx \chi^2$$

Null hypothesis and alternative hypotheses are as follows:

$$\begin{cases} H_0 = \sigma_u^2 = 0 \\ H_0 = \sigma_u^2 \neq 0 \end{cases}$$

According to null hypothesis, LM has Chi-squared Distribution with one degree of freedom (Greene, 2005). The chi-square statistics with grade 1 degree of freedom equals to 3.84. Therefore, if the amount calculated for LM based on pooled model residuals is larger than 3.84, null hypothesis is rejected based on pooled panel model, in favor of random effects model (REM).

According to LM tests results in above table, the values obtained for F statistics is equal to 47.92 compared to model estimation that is more than critical statistics of 3.84. Therefore, null hypothesis is rejected based on pooled model and it shows that REM model is preferred to Pooled model.

Fixed effects versus random effects determination test

In previous section we showed that, considering a special intercept for each bank is better than taking a common intercept for all of them. In other words, both FEM and REM models are better than pooled model. Now we must consider which model is better between two models. Hausman test is used to accomplish this selection. Hausman test is as follows:

H_0: Individual special effects are random (there is no correlation between random effects and descriptive variables)
H_1: Individual special effects are fixed (there is correlation between random effects and descriptive variables)

The test statistic is also presented as follows:

$$H - (\hat{\beta}_{RE} - \hat{\beta}_{FE})' (VAR(\hat{\beta}_{FE}) - VAR(\hat{\beta}_{RE}))^{-1} (\hat{\beta}_{RE} - \hat{\beta}_{FE}) \approx \chi^2$$

In this equation, $\hat{\beta}_{FE}$ is FEM model coefficient $\hat{\beta}_{RE}$ is REM model coefficient and VAR is variance mark. If obtained value for Hausman test is greater than obtained value for chi-square statistic with K degree of freedom, (K is the number of descriptive variables), fixedeffects model (FEM) will be consistent and efficient. However, if obtained value for Hausman test is less than obtained value for chi-square statistic, REM estimators will be consistent and efficient. Firstly, regression is estimated with random effects and then Hausman test is used to test fixed effects versus random effects of regression. Null hypothesis of Hausman test is based on random effects model. If the calculated value of statistics is set in critical areas, random effects hypothesis is rejected in favor of fixed effects. The results of these tests are given in table below.

Table4. Hausman test results for fixed or random panel model

According to results of Hausman test to choose between fixed effects and random effects that are shown in table above, the null hypothesis based on random effects is strongly rejected in favor of fixed effects. In other words, there is a correlation between random effects and descriptive variables and this means that FEM model is appropriate. Therefore, the panel models are estimated with fixed effects in results of investigation, and results are interpreted.

Model Estimation

In this section, we assess and interpret model. The results of model estimation are provided in table below. All variables are calculated annually in model:

$$CR_{it} = \alpha_0 + \alpha_1 ROA_{it} + \alpha_2 ROE_{it} + \alpha_3 NIM_{it} + \alpha_4 LD_{it} + \alpha_5 DE_{it} + \alpha_6 SIZE_{it} + \varepsilon it$$

Where CR_{it} is credit risk of bank i[th] in year t, ROA_{it} is return on asset rate of bank i[th] in year t, ROE_{it} is return on equity rate of bank i[th] in year t,NIM_{it} is Net profit margin of bank i[th] in year t, LD_{it} is loans to deposits ratio of bank i[th] in year t,DE_{it} is total debt to equity ratio of bank i[th] in year t and $SIZE$represents the size of bank i[th] in year t as descriptive variable.

The Model Estimation Results

As reported in previous sections, F and Hausman test results show that panel models have fixed effects.

Table 5. The result of model's estimation using Fixed effect Model

As shown in table above, all variables have significant effect on changes rate of bank credit risks considered in this article and at high significance and confidence level of 95% (5% SEM) except for loan to deposit ratio variable (LD) and firm size (SIZE) that are not significant. Loan-to-deposit ratio and firm size variables have estimation coefficients of -13.739 and 9.400. These variables does not affect significantly on credit risk of banks including private banks active in Tehran stock exchange due to non- significance of estimated model and these two variables cannot be considered as effective factors on banks' credit risk variable.

CONCLUSION

In this paper, the effect of three variables including return on assets rate, return on equity rate and net profit margins of banks on dependent variable is negative and significant at SEM level of 5%. This relationship agrees with theoretical and practical background in the field. So that 1% increase in each of these three variables results in 0.55, 0.15 and 0.12% of banks' credit risk. The effect of total debt to banks equity ratio on dependent variable is positive and significant at 5% SEM level; this agrees with theoretical and practical background in this field. So that 1percent increase in total debt to banks equity ratio leads to an increase of 0.54% in banks' credit risk. So we can say that the larger total debt to banks' equity ratio, the credit risk of bank's stocks will be more.

The analysis of hypotheses suggest that there is significant relationship between credit risk of banks and return on assets rate, return on equity rate and net profit margins of banks listed in Tehran Stock Exchange. Therefore, first, second and third sub- hypotheses will be accepted. The only hypothesis of this paper that there is no evidence for its rejection and results indicate its rejection is fourth hypothesis. Thus, it can be said that there is no significant relationship between credit risk and loans to banks' deposits ratio. Finally, the results of estimations indicate that there is a significant relationship between credit risk and total debt to equity ratio of banks. Then, we can say that fifth hypothesis is accepted and it is not a proof of rejecting this hypothesis. The results of this research agree with the results researches conducted by Bagheri (2013) during 2001-2012, Ashrafzadeh and Mehregan (2013) during 2005-2012, Ballantyne (2000) and Davidson and Dutia (1991).

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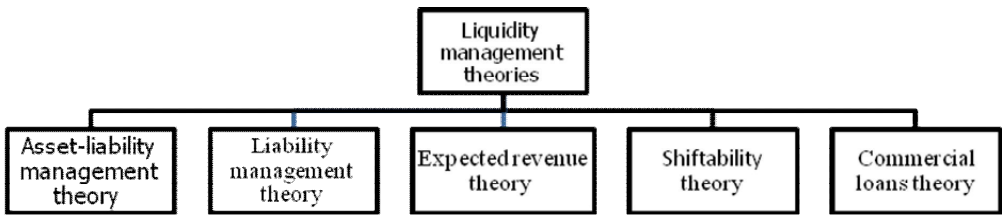

Figure 1. Liquidity Management Theory (Woodworth, 1999)

Table 1. Durability test results with a constant value for variables

Variables	First subtraction		Level	
	ips Statistics	Probability	ips Statistics	Probability
Credit risk	-8.003	0.001	0.912	0.701
Return onEquity rate	-4.807	0.000	0.429	0.523
Return onAssets rate	-	-	-6.168	0.001
Netprofit margin	-	-	-5.863	0.000
Loan-to-deposit ratio	-4.061	0.002	2.184	0.892
Total debtto equity ratio	-2.967	0.000	-0.723	0.174
Firm size	-	-	-7.109	0.000

Table 2. Co integration test results for selected banks of this study

	Description	Obtained statistics
Co integration test statistics	Panel adf-stat	-2.190
	Group adf-stat	-3.127

Table3. Results of LM test

The chi-square statistic probability	Degrees of freedom	The chi-square statistic rate
0.0000	6	47.92

Table4. Hausman test results for fixed or random panel model

The chi-square statistic probability	Degrees of freedom	The chi-square statistic rate
0.0000	6	139.82

Table 5. The result of model's estimation using Fixed effect Model

The estimated coefficients of the model	Amount of Probability Statistics	Amount of t-Statistic	Amount of Coefficient
Intercept (α_0)	0.000	4.69	264.03
Return on Assets Ratio (α_1)	0.052	-1.94	-0.559
Return on EquityRatio (α_2)	0.376	-0.866	-0.158
The Net Profit Margin Ratio(α_3)	0.009	-1.978	-0.125
Loan to Deposit Ratio (α_4)	0.989	-0.703	-13.739
Total Debt to Equity Ratio(α_5)	0.153	1.430	0.543
Firm Size Ratio (α_6)	0.817	1.219	9.400

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RESEARCH ARTICLE

The Study of Relationship between Capital Structure and Market Value per Share in Listed Firms in Tehran Stock Exchange; Evidence from Iran

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ABSTRACT

The main purpose of the present research is to investigate the relationship between capital structure and market value per share in listed companies in Tehran Stock Exchange during the years of 2008 to 2014. Many of the commitments and losses due to capital structure can be detected and controlled and by offering proper strategies, optimal combination of capital structure for corporations can be determined through examining the relationship between capital structure and market value of per share in Tehran Stock Exchange. The present paper is an applied study, conducted analytically and inductively. In this research the value market of corporations' stock is taken as dependent variable and capital structure as independent variable. Moreover the empirical model is estimated by means of econometric tests through panel data. By studying the model regarding fixed and variable effects and Hausman test estimation, the results showed that there is a significant positive and meaningful relationship between the total debt ratios changes to the salaries of shareholders and firm size with price fluctuations and the market value of stock in the studied companies. However there is no significant relationship between long term debt ratios fluctuations to assets and also between growth opportunities with price fluctuations and the market value of the companies' stocks.

Key words: Capital structure, Stock market value, Growth opportunities.

INTRODUCTION

Deciding on the capital structure is one of the most challenging and difficult problems encountered by firms; yet it is the most critical decision regarding the maintenance of their survival. A close look at the researches and academic texts shows that the major cause of firms' failures is the lack or absence of investment efficiency and inappropriate

and insufficient financing on their part. A majority of small firm owners do not possess great commercial skills and therefore they have no adequate inference and understanding of financial markets activities. Hence the existing drawbacks might result in inappropriate investment which jeopardizes the life and survival of the firm (Otami, 2012). One of the most important components of any economic activity is the supply of necessary financial resources; and these resources can be supplied from equity or debts. As a result, firms' financial managers guarantee the best mixture of financing resources or in other words capital structure, and the decisions made in this area result in increasing the firm's value (Mousavi et al., 2011). Distinguishing the patterns in which investors engage in financing and making decisions with respect to the institutional life cycle periods can offer signposts and indicators to the managers, so that they will not commit errors in the course of adopting a financing method. In other words, this study can provide a perspective for the future studies conducted with the objective of patterning the management financing in production firms already incorporated in Iran Stock Exchange.

The present study seeks the answer to the following question: what is the relationship between capital structure and market value per share? On the other hand, inappropriate capital structure for any firm in general, and for small firms in particular influences all aspects of a firm's activities and hence can bring about issues such as inefficiency in marketing the products, incompetency and inability in proper application of manpower and other similar cases (Otami, 2012). No comprehensive study so far has been conducted in the area of capital structure and market value per share in Iran. Nevertheless investigating the relationship between capital structure and market value per share in the firms incorporated in Tehran Stock Exchange can detect and control many of the commitments and losses due to capital structure and by offering appropriate strategies, determine the optimal mixture of capital structure for firms. Due to the significance of examining each of the variables and their mutual effects, the present paper studies the relationship between these variables.

REVIEW OF LITERATURE

Theoretical Foundations

Regarding the relevant costs in each of the various methods of financing, there exist different theories for the determination of firms' capital structure. In general, the following methods can be enumerated:

Net income theory: This theory, first introduced by Durand, considers capital decisions as related to firm evaluation. In other words, change in the financial leverage causes change in the average capital cost and eventually in the firm's value. This change is such that if the degree of financial leverage increases, capital cost average would decrease and as a result, the firm's value (common stock market value) would increase and vice versa.

Net operating income theory: Another theory proposed by Durand is net operating income theory. In this theory, change in the leverage does not cause change in the firm value (stock market value) and therefore, capital cost average is independent from the degree of leverage. In other words according to this theory, with the assumption that k_0 is fixed in all the degrees of the applied leverage, the overall evaluation of the firm is not dependent on capital structure and k_e always increases in relation to the increase in the leverage degree (Gersick et al., 1997) **c)** Traditional Theory: this theory has a direct relationship with leverage degree and k_i increases proportionate with the significant increase in the degree of leverage. Also the optimal capital structure is a point in which K_o reaches its minimum size. Hence in the traditional theory it is hypothesized that each firm possesses an optimal capital structure which is gained by reasonable application of leverage. This structure decreases capital cost and takes the market

value to its maximum level. According to this theory, use of debts to the optimal point can be beneficial and beyond that point, it would increase capital cost to a small extent, resulting in market value decrease.

Miller-Modigliani theory: Modigliani and Miller viewpoint was proposed to challenge the previous theories which provided an unrealistic picture of the real condition. Their theory was based on the hypotheses of asset market theory which is itself adopted from the hypotheses of security portfolio theory of Markowitz (Reilly and Brown, 2011). The results obtained from MM researches showed that utilizing greater amounts of debts does not cause an increase the firm's value (contrary to NI method).

Coulines and Ajibolade (2013) conducted a research in order to investigate the capital structure of small and entrepreneur firms. In their study, capital structure and factors affecting it were surveyed through an analysis of 170 samples of stock exchange companies in Pecan in the period of 2010 to 2013. The results showed that there exists a significant relationship between the firms' capital structure and its size, the age of the managers, their education, their priorities and styles and the age of the owners of the firms. However there was no significant relationship between the firm's life and the extent of managers' familiarity with financial concepts and firms' capital structure. Furthermore Kallunki and Silvola (2011) investigated the extent of activity-based costing system use in different stages of the firm's life. The statistical sample in this research comprised Malaysian stock exchange companies during the years of 1990 to 2012. The applied statistical method consisted of the mean difference test. Their findings showed that due to the change in the management informational needs, the amount of activity-based costing system application is different at multiple stages of life cycle. The extent of using activity-based costing system in firms which are at the stages of maturation and regeneration is greater compared to the growth level. Likewise Mishaeel et al. (1999) showed in their research that effective tax rate and tax shield has no influence on capital structure and financing procedures of English firms. In this research, correlation and regression methods were applied. The study on growth and future growth opportunities also showed a positive significant relationship with capital structure. Further the findings of the research indicated a strong relationship with capital structure and showed that there is a positive relationship between fixed asset components and high levels of inventory, and high levels of debt.

As for the studies conducted in Iran, Sajjadi and Jafari (2012) in a study investigated the capital structure and factors influencing it by examining 70 samples of firms in the period leading to the end of 2011. Findings of this study suggested that there is a significant relationship between the firms' capital structure and its size, the age of the managers, their education, their priorities and styles and the age of the owners of the firms. However there was no significant relationship between the firm's life and the level of managers' familiarity with financial concepts and firms' capital structure. Also Haeri et al. (2012) conducted a study with the subject of theoretical foundations of financing methods, capital cost and capital structure. This article investigated the financing methods, capital cost, and the theories relevant to it. Moreover the importance of the relationship between capital cost, capital structure, and the firm's total value was stated from management point of view. The reason was that by means of capital structure, influence can be exerted on the firm's total value and by considering the specific hypotheses and determining the investors' inferences and thoughts about the degree of financial risk change, the optimal capital structure of the firm can be determined. Nevertheless, the conflict of interests among the firm's owners of bonds and common stock cannot generally be resolved altogether (Haeri and Azizi, 2012). Khalifeh Soltani et al. (2012) also studied the impact of firm's particular characteristics and corporate leading devices on capital structure by means of Tobin model. This research was conducted during the years of 2002 to 2011. Results of the study showed that there is a significant relationship between growth opportunity, firm's size, visible assets and the percentage of institutional ownership with capital structure. Nevertheless, there is no significant relationship between profitability, commercial risk, managerial ownership and the size of board of directors with capital structure.

Variables of Research

The variables of this study comprise dependent, independent and control variables.

Dependent variable: Market value per share: market value per share equals the sum of market value of equity and debts divided into the total number of stocks. Theoretically, this amount is something which can be gained at any specific moment from market for per share (Hejazi and Arefi, 2004).

Independent variable: Capital structure. The capital structure ratios determine and evaluate the relationship between financial resources applied by a commercial unit with respect to debts or equity and basically examines the way they are combined. In order to measure capital structure, two ratios have been applied (Collins et. al., 2012): book value proportion of long term debts to the sum of assets and total debt to equity

Control variables

Firm's size: There are different criteria for measuring "firm's size" variable. These methods include the total sum of assets, sale amount and the total number of employees. In this study, natural logarithm of the total assets has been used to measure the variable "firm's size" (Hassas Yeganeh et al., 2008).

Growth opportunities: Adam and Goyal (2008) and Lopez and Vicente (2010) argue that net incomes and the firm's operating costs can also indicate the ratios of growth opportunities and therefore are apt for use. For the same reason, in this study net incomes and the firm's operating costs have been used as control variables.

Hypotheses of the research

Based on the study's objectives, the following hypotheses have been formulated:
Hypothesis 1: there is a significant relationship between capital structure and market value per share in the firms incorporated in Tehran stock Exchange.
Hypothesis 2: there is a significant relationship between the ratio of long term debts to the value of sum of assets and market value per share in the firms incorporated in Tehran Stock Exchange.
Hypothesis 3: there is a significant relationship between total debt to equity and market value per share in the firms incorporated in Tehran Stock Exchange.
Hypothesis 4: there is a significant relationship between firm's size and market value per share in the firms incorporated in Tehran Stock Exchange.

METHODOLOGY AND MODEL ESTIMATION

The methodology of this study is analytic and inductive. Moreover the method based on which the hypotheses are tested is panel data method, and the time period under investigation is 2008 to 2014. The theoretical foundations as library research are extracted from the relevant articles. Finally the estimation of the model is carried out by means of econometrics techniques. The following model has been applied for the purpose of the present study and also to test the above mentioned hypotheses: (Collins et al., 2012)

$$SMV_{it} - \beta_0 + \beta_1 LEV_{it} + \beta_2 KEV_{it} + \beta_3 SIZE_{it} + \beta_4 G_{it} + \varepsilon_{it}$$

Here, SMV is market value per share of the (i) firm in the (t) year, LEV is the ratio of total debt to equity of (i) firm in the (t) year, KEV is the ratio of long term debts to the assets (i) firm in the (t) year, SIZE is the firm's size in the (t) year and G indicates the growth opportunities of (i) firm in the (t) year as explanatory variable.

Variable stasis test

Based on the results of the stasis test, none of the variables present in the model are in the stasis level. However according to the results of the first-order difference of the variables, the null hypothesis has been rejected and the variables are significant in the significance level of 1. As a result, all the variables relevant to the intended firms in this study have a common root and thus are stasis from first-order, I (1).

Based on the findings of this research, due to the non-stasis of the variables in the level, consensus tests have been applied. This is because in the case of non-stasis of the variables, the results can be trusted only in case there exists a consensus relationship between the variables.

Consensus test

In this study, consensus test of Pedroni has been applied in order to investigate the existence or nonexistence of a consensus relationship between the variables. In this section two parametric statistics, Panel-t and Group-t, have been applied. Regarding the normal standard distribution of these two statistics, the results have been compared with critical amount of -1.96 according to the following table. Based on the results obtained, in the firms under investigation, the absolute value of the numbers obtained is more than 1.96 and the null hypothesis indicating the lack of consensus relationship between the variables is prone to be rejected. Based on this, there is a long term relationship between the variables in the investigated firms.

Model estimation capability test as panel data (Fixed Effect Model)

In order to estimate the model, a number of tests are first conducted to determine the type of panel model. The Fixed Effect Model is applied to detect the model being panel or pooled. Here F statistics is used in relation with the restricted regression as opposed to unrestricted regression by means of residual sum of squares or coefficient of determination. The following are the statistical hypotheses in these tests:

H_0: The intercept of all the firms is equal (all the fixed effects equal zero). (Pooled Model)
H_1: At least for one of the firms, the intercept is different from other firms (Panel Model).

The test statistics has been proposed by Greene (Greene, 2002) based on coefficient of determination:

$$F\,(N-1, NT-N-K) = \frac{(R^2_{LSDV} - R^2_{Pooled})/N-1}{1-R^2_{LSDV}/(NT-N-K)}$$

Here R^2_{LSDV} is the coefficient of determination of the unrestricted model (FEM) and R^2_{Pooled} is the coefficient of determination of the restricted model (Pooled), N is the number of the firms, T is the number of the studied periods, and K is the number of explanatory variables.

In this research, as it is followed below, the F test proposed by Waldrig or Green has been applied to investigate the existence of fixed effects. It must be noted that if the amount of calculated F, based on the above equation, is bigger

than F in the table with the degree of freedom of (N-1) and N (T-1)-K, the null hypothesis is rejected. Otherwise the null hypothesis is supported. The results of this test are shown in the table below.

As can be seen above, based on the results obtained from the F test, the calculated amount of F statistics is significant. Thus the null hypothesis based on which panel models are pooled is rejected to the advantage of being panel. As a result it can be concluded that each firm has its own particular intercept and considering just one intercept for all firms is inappropriate.

Now that the superiority of FEM model over Pooled model is proved, the randomness of these Random Effects Model (REM) as opposed to the effects being pooled can be studied based on the LM test introduced by Breusch and Pagan. This test is based on the residuals gained from restricted model. The test is as follows:

$$LM - \frac{NT}{2(T-1)}\left[\frac{\sum_{i=1}^{N}[\sum_{t=1}^{T} e_{it}]^2}{\sum_{i=1}^{N}\sum_{t=1}^{T} e_{it}^2} - 1\right]^2 - \frac{NT}{2(T-1)}\left[\frac{\sum_{i=1}^{N}(T\bar{e}_i)^2}{\sum_{i=1}^{N}\sum_{t=1}^{T} e_{it}^2} - 1\right]^2 \approx \chi^2$$

The null hypothesis and the alternative hypothesis in this test are as follows:

$$\begin{cases} H_0 = \sigma_u^2 = 0 \\ H_0 = \sigma_u^2 \neq 0 \end{cases}$$

Under the null hypothesis, LM has Chi-squared Distribution with one degree of freedom (Greene, 2002). The amount of Chi-squared Distribution with one degree of freedom equals 3.84. Therefore if the calculated amount for LM based on the residuals gained from restricted model is bigger than 3.84, the null hypothesis, that is the model panel being Pooled is rejected to the advantage of Random Effect Model (REM).

The results of the LM test which are shown in the table above strongly reject the null hypothesis regarding the model being unrestricted and show that the REM has superiority over the restricted model.

Fixed Effects versus Random Effects determination Test

As was shown in the previous section, FEM and REM are both superior to the restricted model. Now it must be determined which of these two models is a better alternative. In order to do this, Hausman test is applied which is arranged as follows:

H_0: There is no correlation between random effects and explanatory variables (fixed effects are random).
H_1: There is a correlation between fixed effects and explanatory variables (effects are fixed).

The test statistics is as follows:

$$H - (\hat{\beta}_{RE} - \hat{\beta}_{FE})'(VAR(\hat{\beta}_{FE}) - VAR(\hat{\beta}_{RE}))^{-1}(\hat{\beta}_{RE} - \hat{\beta}_{FE}) \approx \chi^2$$

In this equation $\hat{\beta}_{FE}$ is the coefficient of FEM model, $\hat{\beta}_{RE}$ is the coefficient of REM model and VAR is the sign of variance. If the calculated amount by Hausman test is greater than the amount of Chi-squared statistics with K degree of freedom (K is the number of explanatory variables), the Fixed Effect Model (FEM) is efficient and compatible and the Random Effects Model (REM) will be incompatible. However if the calculated amount for the

Hausman test is less than Chi-squared statistics, the REM estimators would be considered as efficient and FEM estimators as inefficient (Johnston, 1997).

Based on the Hausman test results for the selection among fixed and randomness of the effects, as shown in the table above, the null hypothesis with respect to the randomness of effects is strongly rejected to the advantage of the fixed effects. In other words, there is a correlation among random effects and explanatory variables and this means that FEM model is appropriate. Hence in the results section of this article, panel models with fixed effects will be estimated and their results will be discussed.

RESULTS

Model's estimation

As can be seen in the table above, all the variables present in the model have a significant effect on the extent of changes in the stock price index in the intended firms surveyed this study. They are also in a high level of significance (alpha level of 1%). Basically the two variables and long term debts ratio to the level of assets in the studied firms and the control variable, that is growth opportunities, is acceptable in the alpha level of 10%. In other words, in the alpha level of 95% the variables of total debt ratio to equity of the firm (LEV) and the firm's size (SIZE) have a significant reationship and the variables of the long term debts ratio to firm's assets (KEV) and the firm's growth opportunities (G) have an insignificant relationship with the dependent variable, that is stock market value (SMV).These explanatory variables have a very high expalanatory power in this amount of distribution (about 97.8%). As it is shown above, the explanatory variables changes presented in this article can explain around 98 percent of the dependent variable (that is stock market value in the firms studied in this research). The statistics amount of Durbin Watson statistics is in its acceptable scope and this can be a sign of lack of autocorrelation of the dependent variable (around 2.10).

CONCLUSION

Practical Suggestions

Among the variables present in the model in this research, total debt to equity and firm's size have a positive and significant effect (in the alpha level of 1%) and long term debts ratio to the level of assets and growth opportunities variable have a positive and significant effect (in the alpha level of 10%) on the extent of stock market value changes in the firms studied in this article. In other words, these two variables are insignificant in the model and have exerted no effect on the stock market value changes in the firms. The effect of debt to firm equity variable is positive on the dependent variable and is significant on the alpha level of 1%. This relationship is consistent with the theories and experimental history in this area. The effect of firm's size variable on the dependent variable is also positive and significant on the alpha level of 1%, and this is in line with the theories and experimental history in this field as well. Therefore it can be said that the further the size of the firm and the larger the scope of its activity, the greater its stock market value. Yet the effectiveness coefficient of long term debts ratio to asset level and control variable (growth opportunities) is insignificant and it can be said that there is no significant relationship between these variables and the stock market value variable.

Analysis of this study's hypotheses shows that there is a significant relationship between capital structure and market value per share in the firms incorporated in Tehran Stock Exchange and as a result, the main hypothesis of the research is supported. From another perspective however, if the variable related to capital structure is considered as long term debts ratio to the asset level of the firms, this hypothesis is supported just in case we consider 90 percent

alpha level for the estimation of the model. Regarding the secondary hypotheses of this research, only the second and the third hypotheses are supported. In these two hypotheses it was claimed that there is a significant relationship between total debt to equity and market value per share in the firms incorporated in Tehran Stock Exchange and between firm's size and market value per share in the firms incorporated in Tehran Stock Exchange. However, the first hypothesis according to which there is a significant relationship between long term debts ratio to assets total value and market value per share in the firms incorporated in Tehran Stock Exchange is rejected.

Based on the findings of this research, investors and financial analysts are advised to take into consideration the factors investigated in this article while making economic decisions based on price fluctuations and stock market value, because as was shown, these factors can have a huge impact on price fluctuations. In order to increase the profitability of firms active in Tehran Stock Exchange, specifically firms studied in this article and regarding the results obtained from the model's estimation, and also the fact that the effect of the firms' long term debts to their sum of assets on the firm's stock market value has become positive, it is suggested that these firms adopt policies towards increasing the ratio of debts to their total assets (although the long term perspective in costing should be taken into account by firm's managers). Furthermore, considering the fact that the second hypothesis of the study is supported and the effect of the of the firms' debts ratios to their sum of equity on the firms' stock market value has become positive, it is suggested that they increase their ratio of total debts to the total equity with respect to the current and the future status of stock market. Taking this fact into account, it can be stated that the bigger and more the size of the firms under investigation, the greater their stock market value. Also since the third hypothesis of the research is supported, it can be suggested that firms, by considering the production scale and its economic effect, should take measure to increase the size of their firms. Nevertheless as stated earlier, this scale increase should not be done in a way that firms are located in the third region of production.

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Table1. The results of the IPS with a fixed effect

variable	Level		First difference	
	Statistic	Prob	Statistic	Prob
SMV	0.810	0.791	-8.242	0.000
LEV	0.327	0.628	-4.524	0.000
KEV	3.687	0.999	-7.945	0.002
SIZE	-0.307	0.379	-5.863	0.000
G	-0.419	0.523	-6.009	0.000

Table 2. The results of the Consensus test for selected companies

Statistics	Value statistics
Panel adf-stat	-3.230
Group adf-stat	-2.961

Table 3. Existence of fixed effects for the panel model test (results of the F test).

Significance	F statistics	
Rejection of the H_0	248.65	H_0: The model being Pooled.

Table4. The result of LM Test

Prob.	Chi-Sq. d.f.	Chi-Sq. Statistic
0.0000	63	5057.42

Table4. The result of Hausman Test for being Fixed or Random of Panel Model

Prob.	Chi-Sq. d.f.	Chi-Sq. Statistic
0.0000	4	362.44

Table 5. The result of model's estimation using Fixed effect Model

Fixed Effect Model	β_0	β_1	β_2	β_3	β_4
β_i	10316	1.08	1.76	0.87	0.123
t-Statistic	16.72	31.29	0.11	26.95	187.48
Prob	0.00	0.00	0.93	0.00	0.80
	D.W= 2.10		R^2= 0.978		

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RESEARCH ARTICLE

The Influence of Brand Social Responsibility on Customer Loyalty: Studied in Mahan Air

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ABSTRACT

Brand personality is an attractive and interesting concept in the marketing world today. Efficient and proper management is very effective in achieving goals such as customer satisfaction, loyalty and profitability as well as consisting of brand personality. In personality approach, brand primary function is to mull over the interaction of consumers with brand personality and use it to build and express their self-interest. Brand is related to the consumer and used by him. In brand management, the concept of brand personality is used as a set of characteristics associated with the brand. The aim of this study is to explore the impact of brand social responsibility on consumer loyalty. Statistical population includes individuals referred to Mahan Air in Tehran to buy traveling tickets during the period from 23 July to 22 August 2014. The research findings confirm all research hypotheses. Moreover, this is a descriptive survey of customers and users of Mahan Air's services and products. The research findings show that social responsibility has the highest impact on the quality of services. In addition, from all effective factors in brand loyalty, brand personality has the highest impact.

Key words: Brand, brand personality, brand social responsibility, brand loyalty.

INTRODUCTION

Nowadays, brand (trade names) is one of the main institutional assets in many countries. Therefore, brand management is position is a managerial position in structure of the organizations and it is supported by senior management. Powerful brands try to provide customer' current and future desires more accurate. Research on branding has occupied the attention of many researchers for many years. Keller (1998) states that brand loyalty is one of the organization's intangible assets playing an important role in long run growth and profitability. A brand is an abstract of identity, originality, features and differences. Many studies emphasize on loyalty factors including satisfaction; but social elements are more important in current situation so that recent marketing researches are conducted in the psychological lens. It frees commercial decisions from its former single dimension and introduces multilateral dimensions (Khorshidi & Moghadami, 2003). With strategic decisions of business managers in the community, some factors have changed the society. In this manner, the importance of attention to social responsibility in customer loyalty literature is growing. A brand with active social responsibility may act in two approaches: first, to do desirable activities for the environment; second, not to do activities damaging the environment. The term personality defines customers' sustainable and stable responses to environment. Therefore, personality can be used as a variable for analysis of consumers responses to products or brands. Hence, businesses can communicate with their clients, and succeed by creating a distinctive brand personality (Lin, 2010). Brand personality is an attractive and interesting concept in the marketing world today. Efficient and proper management is very effective in achieving goals such as customer satisfaction, loyalty and profitability as well as consisting of brand personality. In personality approach, brand primary function is to mull over the interaction of consumers with brand personality and use it to build and express their self-interest (Khodadad Hosseini, 2012). Brand loyalty increases profits through making barriers to change orientation of customers to competitors, increases the ability to respond to threats of competitors, and increases sales and reduce customer sensitivity to the marketing efforts of competitors. The study of factors affecting customer loyalty to a brand allow producers to realize the important factors for customers; this help the producers to employ marketing strategies for attracting customers and profitability and achieving more success. This paper describes the concept of social responsibility and brand measures and activities including general duties and commitments to the community. Various models have been introduced for studying brand loyalty; but these models have less explored the influences of social responsibility and brand personality. This article emphasizes on two dimensions of brand personality the relation to social responsibility and brand loyalty.

Theoretical Foundations

Customer: customer is an organization or individual supported by a service or product and pays the cost instead (Kotler & Armstrong, 2005).

Customer loyalty: Customer loyalty has been identified as a significant factor in the success of a company's business. Loyalty refers to a strong commitment to buy a superior product or service in the future so that the same brand or product will be purchased and efforts despite the impact of marketing by potential competitors (Carolin, 2002). Organizations are required to satisfy the needs of clients beyond their expectations and focus their attention from customer mere satisfaction to loyalty and trust by fostering long-term, mutual and profitable communication for both sides. (Elahi and Heidari, 2005). Marketing experts have enumerated many advantages for loyalty; some of the most obvious ones are reducing the cost of attracting new customers, reducing the sensitivity of customers to price changes, offering benefits of customer lifetime value (derived from upward and cross selling), creating positive performance by increasing the predictability, increasing obstacles for the entrance of new competitors.

Brand: A name, term, sign, logo or design used to identify and distinguish the goods or services of an organization from goods and services of other organizations; it will result in distinct (Kotler & Armstrong, 2005). Brand is a part of presentable trademark since the trademark cannot be identified in words of language; the goods or services are

identified by their brands and determining their patent or copyright by brand; in this way, their rights of publication, reproduction and publication will be subject to the rule of law (Ambler et al, 2002). It is a symbol associated with a large number of assets and intellectual commitment, which aims to identify and differentiate product (Keller, 1998). Brands create value for the shareholders in the following ways: (1) lead the choice of consumers, (2) increase customer loyalty, (3) make entry into new markets possible, (4) make product prices increases possible, and (4) increase employment.

Brand social responsibility: responsibility means socially individuals and organizations' morality and sensitivity to social, cultural and environmental issues. Seeking to establish social responsibility helps individuals, organizations and the government to have a positive impact on the progress of work and community (Vilppo 2011).

Brand personality: consumers tend to attribute human characteristics to brand (Noroozi & Gholami, 2014). Brand personality is an attractive and interesting concept in the marketing world today. Aaker (1996) regards brand personality as the core and the nearest variable in customer decisions when buying. Brand personality is one of the main constituents of brand identity. Thus, researchers consider brand identity and brand image as a multidimensional structure in which brand personality is one of the main constituents (Geuens et al, 2009).

REVIEW OF LITERATURE

In a research titled "Underlying factors, brand loyalty and brand veer on the young consumers' purchasing decisions," Safarzadeh et al (2011) investigated the role of underlying factors, brand loyalty, and brand veer in the young consumers' purchasing decisions. Ball et al (2007) studied the role of personalization in customer loyalty in banks in Portugal in the context of their business with ECSI mold (Ball, machas, 2004: 65). Chou (2009) asserts that customer value plays the role of mediator in the relationship of trust and loyalty. In addition, he knows the sources of customer trust in three areas: (1) trustful behaviors to the customers by the organization, (2) implementing policies of top management and employees (employees who interact directly with the customer), (3) the individual willingness to trust customers. Belén del Río et al (2001) studied the effect of brand associations on consumers' behavioral reactions; they analyzed the associations of brand based on advantages and functions connected customers to the signs. In "Positioning and branding your organization," Knox (2004) conducted a research on a bank named The First Direct; he argues that positioning and branding of an organization are determined by brand reputation, the performance of its products and services, the share of its products and services presented to a manager in the supply chain. This method concentrates on internal and external factors of an organization and help in the promotion of a brand's fame. Mittal and Kamakura (2001) have found that there is a significant difference in behavioral loyalty (repurchase) despite the identical satisfaction due to the characteristics of respondents such as age, education, financial status, sex and place of residence. This research suggests that customers with different characteristics have different threshold levels and different possibility of re-buying. The research examined the impact of demographic factors on the relationship between satisfaction and loyalty.

Research Hypotheses

Based on the issues expressed in the previous section, the following hypotheses have been considered in this study; then, the researcher tries to test it and draw conclusions about each hypothesis.
First hypothesis: brand social responsibility has significant effects on service quality.
Second hypothesis: brand social responsibility has significant effects on product quality.
Third hypothesis: brand social responsibility has were significant effects on brand personality.
Fourth hypothesis: product quality has a significant impact on brand loyalty.
Fifth hypothesis: service quality has a significant impact on brand loyalty.
Sixth hypothesis: brand personality has a significant impact on customer loyalty.

Seventh hypothesis: With respect to the mediating role of service quality, brand social responsibility has significant effects on brand loyalty
Eighth hypothesis: With respect to the mediating role of product quality, brand social responsibility has significant effects on brand loyalty.
Ninth hypothesis: With respect to the mediating role of brand personality, brand social responsibility has significant effects on brand loyalty.

According to the hypotheses of the study, the research model is drawn in Figure 1.

METHODOLOGY

In terms of goals, this is practical study and a casual descriptive survey in terms of approaches. The information for this study was collected first through library study; then in a field study using questionnaires. As this research has been carried out in the field of marketing, it contains isuues about brand and branding. Research data were collected in Mahan Air offices in Tehran during the period from 23 July to 22 August 2014.

Statistical population includes individuals referred to Mahan Air in Tehran to buy traveling tickets; they fill questionnaires. To ensure sample size sufficiency, the researcher used Cochran sampling formula for infinite sample. The calculations determine that the sample size should not be less than 384 with ±5% error and 95% reliability. Both descriptive and inferential methods (one sample t-test to measure the relationship between variables and structural equation modeling to examine the research model) were used to analyze data. It should be noted that all calculations and statistical analysis were performed by SPSS, Lisrel. The research was conducted with a researcher made questionnaire. The first section has four questions measuring personal characteristics such as gender, age, education, etc. the second section includes 20 items evaluating variables of social responsibility, quality of service, product quality, brand personality and brand loyalty. To match the research model and evaluation of hypotheses, due to the lack of previous research, the original questionnaire of the study was arranged by the researcher and distributed among the population after implementation of the necessary adjustments and changes according to the opinions of experts (professors and experts). It can also be argued that content validity was used to assess the validity of the research. Cronbach Alpha was used to check the reliability of the questionnaire; the value obtained for this study (0.87) verified the reliability of research tool.

FINDINGS

Descriptive statistics: according to research finding, 240 samples (62.5%) of respondents were single and 144 (37.5%) respondents were married. The highest rate of frequency is seen in the age group of 31 to 40 years and the minimum rate is observed in the age group of 18 to 31 years (14.32%). Most of the respondents have B.A. or M.A. degrees (about 78 percent of all samples). The least rate in this regard belongs to P.h.D respondents (2.6%). Most of the samples (67.7%) are employed.

Testing Data Normality (Kolmogorov-Smirnov Test):

K-S (Kolmogorov-Smirnov test) was used to check normality of testing results. The results show that all the statistics are over 0.05 and the assumption of normality is confirmed.

Examination of Hypotheses

First hypothesis: brand social responsibility has significant effects on service quality.

The correlation coefficient (0.81) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.54 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor, it can be argued for more impact on service quality, more attentions to brand social responsibility and its support activities are required.

Second hypothesis: brand social responsibility has significant effects on product quality.

The correlation coefficient (0.87) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.73 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor, it can be argued for the success of predicted goals in the field of improving the quality of products, attentions to support activities of brand social responsibility are required.

Third hypothesis: brand social responsibility has were significant effects on brand personality.

The correlation coefficient (0.86) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.64 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor, it can be argued that attention to factors such as brand social responsibility, along with other factors is required for better and more efficient management of resources and impact on brand personality

Fourth hypothesis: product quality has a significant impact on brand loyalty.

The correlation coefficient (0.85) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.66 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor, it can be argued that for enhancing customer loyalty to the company''s brand, more attention to providing products with good quality is required; it present the commitments properly.

Fifth hypothesis: service quality has a significant impact on brand loyalty.

The correlation coefficient (0.74) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.74 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor, it can be argued that for enhancing customer loyalty to the company''s brand, more attention to providing appropriate services that meet customer needs well is required.

Sixth hypothesis: brand personality has a significant impact on customer loyalty.

The correlation coefficient (0.80) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.80 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor on customer loyalty, it can be argued that for

enhancing customer, more attention to company's brand personality and characteristics and offering products and services that represent the company brand personality is required.

Seventh hypothesis: With respect to the mediating role of service quality, brand social responsibility has significant effects on brand loyalty.

The correlation coefficient (0.72) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.70 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor on loyalty, it can be argued that for enhancing customer loyalty, more attention to company's brand personality, characteristics and offering simultaneous attention to the quality of services and the effectiveness of brand social responsibility is required.

Eighth hypothesis: With respect to the mediating role of product quality, brand social responsibility has significant effects on brand loyalty.

The correlation coefficient (0.68) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.67 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor on loyalty, it can be argued that for enhancing customer loyalty, more attention to company's brand personality, characteristics and offering more attention to the quality of products and strategies to improve the products in line with brand social responsibility is required.

Ninth hypothesis: With respect to the mediating role of brand personality, brand social responsibility has significant effects on brand loyalty.

The correlation coefficient (0.77) showed strong correlation between variables. The results of ANOVA and the coefficients indicate the significance of regression and β coefficient (equal to 0.68 and opposite of zero) in the regression equation (Sig = 0.000 <0.05). Thus, the null hypothesis is rejected and the research hypothesis is confirmed. According to the results, indicating a high impact of this factor on loyalty, it can be argued that for enhancing customer loyalty, more attention to company's brand personality, characteristics and offering more attention to characteristics of the brand reflected in the form of personality is required; the personality should try to offer customers proper services in line with social responsibility

The results of testing hypotheses are summarized in Table 1. The results of the study show that responsibility has highest impact on the quality of services. In addition, from all effective variables in brand loyalty, service quality has the highest impact. It means concentration on service quality increases loyalty.

Structural Equation Modeling: structural equation modeling has been used for evaluation of the relationships among variables. LISREL output is shown in Figure 2.

As seen in the results of the research model, from all effective factors in brand personality, social responsibility has the highest path coefficient rate (0.81). Besides, from all effective factors in brand loyalty brand personality has the highest path coefficient rate (0.80).

Chi-square on degree of freedom is 2.91. Thus, the amount of Chi-square on degree of freedom is (x^2/df) is less than 3. This indicates the appropriateness of structural equation modeling. The root mean square error of approximation (RMSEA) is 0.042. Comparative Fit Index (CFI) is 0.95, goodness of fit index (GFI) is 0.94; hence, structural equation

modeling is fitted well. Test results show that since the root mean square error of approximation and the goodness of fit index are less than the defined measure, model has had a good fit to real world's data. In other words, general results of structural equation model that explain the studied relations have been confirmed.

DISCUSSION AND CONCLUSION

This article investigates the impact of strategic, technical and tactical factors on the successful implementation of enterprise resource management system and it evaluates effectiveness of this factors. Model checking showed that the model had a good fit and all the studied parameters had adequate fit amounts. According to the research findings, responsibility highest impact on the quality of services. Among the variables that influence brand loyalty, quality of service has the highest impact. It means concentration on service quality increases loyalty. Moghadam et al (2011) have found the same results; they assert that among factors influencing brand loyalty, the quality of service has been the most affected. A research conducted by Heidarzadeh (1999) confirms this assertion. He concluded that brand responsibilities have the highest impact on quality of services. Therefore, it can be said that the findings of this study are consistent with results of previous studies.

Practical Recommendations

With regard to the high impact of brand social responsibility on the quality of services, it is suggested for companies to concentrate more on the implementation of strategies for brand social role and participation in social activities.

With regard to the effect of brand social responsibility on the quality of products, it is suggested that organizations should provide elements of the public interest (eg environment) in order to improve the quality of products.

Due to the impact of product quality on brand loyalty, companies should draw attentions to improving the quality and delivery of products and customer satisfaction in order to enhance customer loyalty.

Considering the impact of service quality on brand loyalty, providing new services that meet customer benefits requires more attention and higher quality in order to enhance customer loyalty to the brand.

With respect to the influence of brand personality on customer loyalty, companies should pay more attention to mechanisms affecting brand personality to increase customer loyalty and they should try to understand brand properties and focus on its strengths.

Suggestions for future research

According to the results, the following suggestions for future research seem necessary:

- Conducting researches in other industries or companies than the statistical population of this study.
- Studying the impact of other factors on customer loyalty to the brand.
- Studying the imapact of moderator variables (such as sex and demographic characteristics).
- Prioritization of underlying factors influencing customer loyalty.
- Identification of the other benefits of brand social responsibility.
- Assessing the factors affecting product quality from the viewpoint of customers that leads to more loyalty of customers to the brand.
- Examining other indicators affecting brand social responsibility.

Since this research focus on psychological image and discussions. Other investigations can compare and examine behavioral and attitudinal discussions.There are other control, independent, mediating, and adjusted variables.

Research Limitations

This research was conducted on individuals referred to Mahan Air in Tehran; the results should apply carefully to other places.Data were collected during the period from 23 July to 22 August 2014. The results should apply carefully to other months and seasons.Considering the condition governing the research, space and time of the investigation may have less generalization; thus the results nay be distorted.Persian resources were found rarely for research

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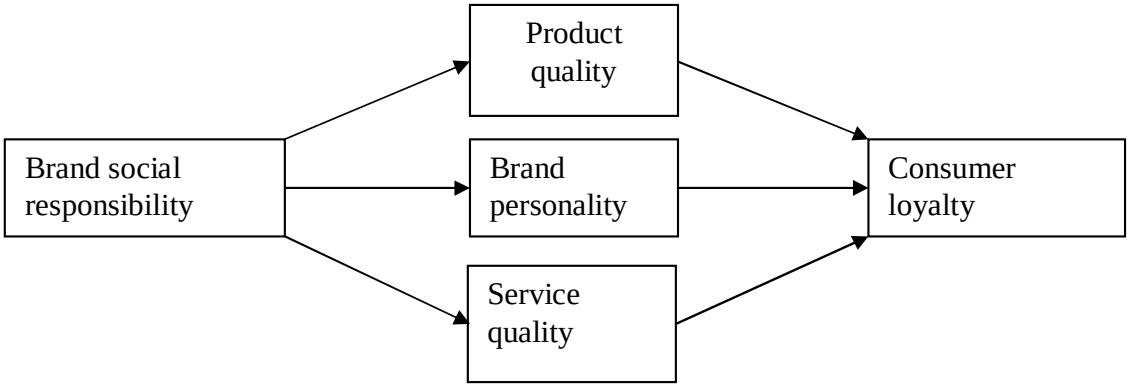

Figure 1

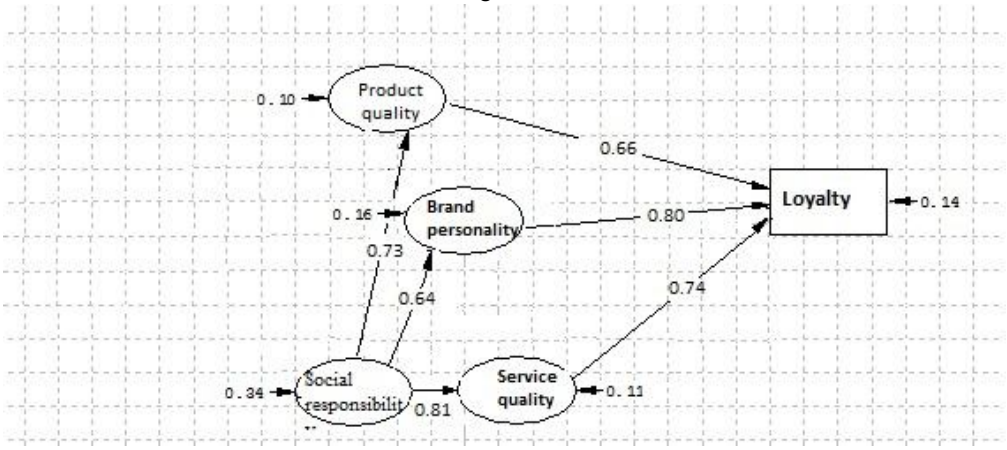

Figure 2: Output of structural equation model results when coefficients are significant

Table 1: Results of testing research hypothesis

Hypotheses	Degree of freedom	F-statistics	β	Confidence level
First hypothesis	383	167.434	0.81	0.000
Second hypothesis	383	115.558	0.73	0.000
Third hypothesis	383	220.969	0.64	0.000
Fourth hypothesis	383	250.969	0.66	0.000
Fifth hypothesis	383	167.434	0.74	0.000
Sixth hypothesis	383	115.988	0.80	0.000
Seventh hypothesis	383	105.228	0.70	0.000
Eighth hypothesis	383	103.231	0.67	0.000
Ninth hypothesis	383	104.997	0.68	0.000

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RESEARCH ARTICLE

The Analysis of Tension Distribution in Composition Joint of One Side of Metal Corner Elite and Bolt and Nut by Finite Elements

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ABSTRACT

In analysis of tension distribution in joint structure of one side of corner elite of metal, bolt and nut, the empirical method with finite elements is investigated. in this analysis, the effect of elite thickness (1-2-4mm) and elite length (25-35-45mm) was evaluated on tension distribution in composition joint of metal corner elite and bolt and nut. The results showed that by increasing elite thickness, tension was reduced at first and then it was increased. By increasing elite length, tension is reduced.

Key words: Finite elements, Elite joint, Tension

INTRODUCTION

In wooden structures, parts are connected and joints are the main sections and sensitive rings among the elements are among the elements of a structure. Joints can tolerate the load continuously and foundation of structure is created. Joints are main session of structure and evidences show that joints guarantee the safety of structure and its beauty. As structural movement of wood to failure is one of its weaknesses, these are weaknesses of joints and they are important based on the design of joints. Although there are a few written studies about design of joints engineering in future structure, a few studies have been conducted to compute the loan on joints strength and their size. To formulate the equations of calculations of design, no efforts have been made. The main reason is inadequate empirical evidences and high involved variables. Various studies have been conducted on bending moment capacity of corner joints with different fasteners as bolt, pin, biscuit, spline joint and adhesive edge. Based on the significance of this issue, the present study is aimed to evaluate the bending moment capacity of elite joint.

REVIEW OF LITERATURE

Wilkinson (1991) investigated wooden pin load toleration. The results showed that load toleration along the pin based on specific mass of wood species but load toleration in the pins loaded perpendicular to grains was based on specific mass and wooden pin diameter. Zhang & Eckelman (2002) evaluated the lateral resistance of wooden pin in plywood and oriented strandboard joints with wooden pin diameter variables and influence depth. This study aimed to measure the power of plywood and oriented strand board to tensile and bending load. Based on the study of Chialin Hoa and Eckelman (2004) in joints in which screw is used as the main fastener, has high resistance compared to the joints in which screw is used as auxiliary fastener. Guntekin (2004) evaluated the resistance of elite joints in particleboard and MDF. Based on the results, resistance of wooden dowel joints was more than that of elite. (Altinok et al 2008)

MATERIALS AND METHODS

Finite element model

The following Figure shows a view of modeling wooden structure with elite joint in ABAQUS software.

Mechanical properties

Wood is an example of an orthotropic material (perpendicular main axle) ; that is, it has unique and independent mechanical properties in the directions of three mutually perpendicular axes: longitudinal, radial, and tangential. Mechanical properties of wood as in this Table are based on the sampling methods and wide analysis based on the references (Esfandyari and taghavinegad, 2007).

Also, mechanical properties of elit metal joint of steel are shown in the following Table.

Loading and boundary conditions

In the following Figure, a view of loading and boundary conditions is shown.

The effect of elite thickness

The numerical analysis on thicknesses 1,2,4 mm elite is done. The elite length is fixed and 25mm

The effect of elite length

The effect of elite length in tension distribution and bending moment capacity of wood is shown as followings (25, 35, 45mm)

DISCUSSION AND RESULTS

In the following Figure, the changes of tension distribution and moment with the increase of thickness are shown.

In the following Figure, the changes of tension and moment distribution with the increase of elit length are shown.

CONCLUSION

Based on the charts, the results show that in tension and moment distribution changes, by increasing thickness of one side of elite, at first tension is reduced (3mm), then by increasing the thickness of elite, tension is increased to thickness 4mm and the moments have no change with the increase of thickness of one side of elite to diameter 3mm and it has highly increase above this thickness (4mm) (350N.mm). The changes of tension distribution can be reduced by increasing the length of one side of elite and moment changes with the increase of length of one side of elite to 37mm are descending and from length 39mm, it is ascending.

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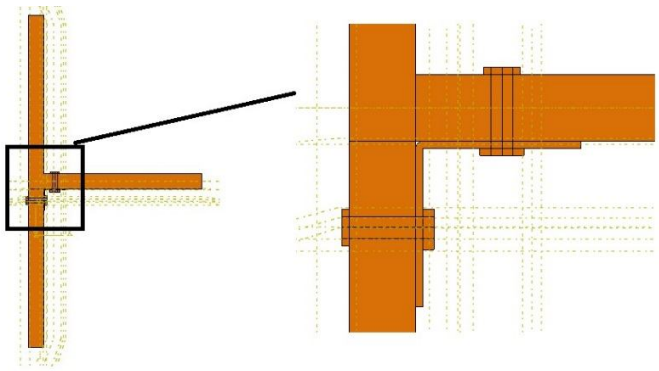

Figure 1- Schematic of finite elements model and elite, bolt and nut joints on one side

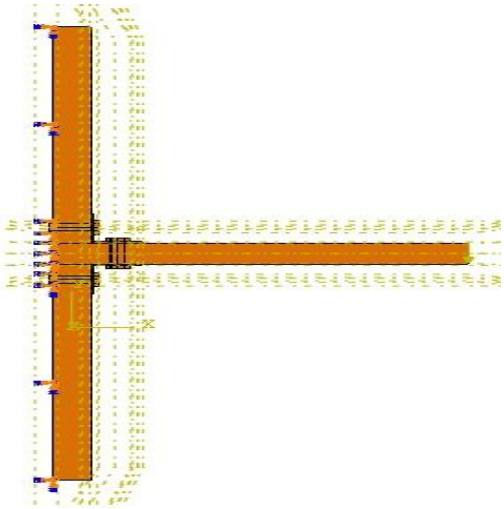

Figure 2- A schematic of loading and boundary conditions

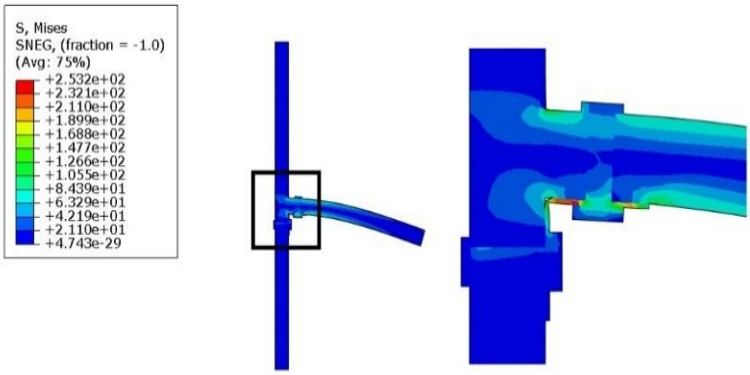

Figure 3- Tension distribution in wood structure (in Mpa)

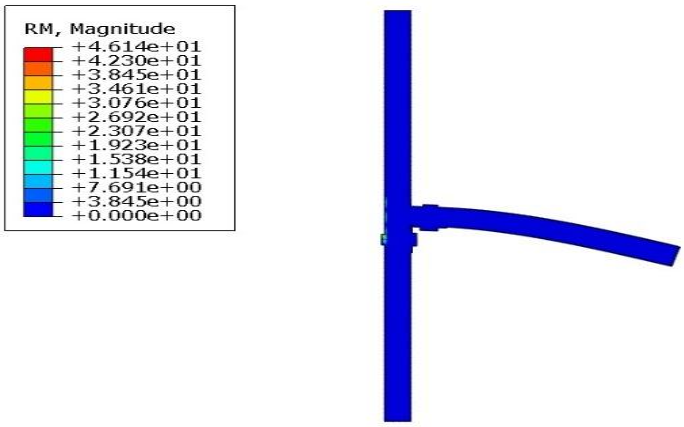

Figure 4- Bending moment distribution in wood structure (in N/mm)

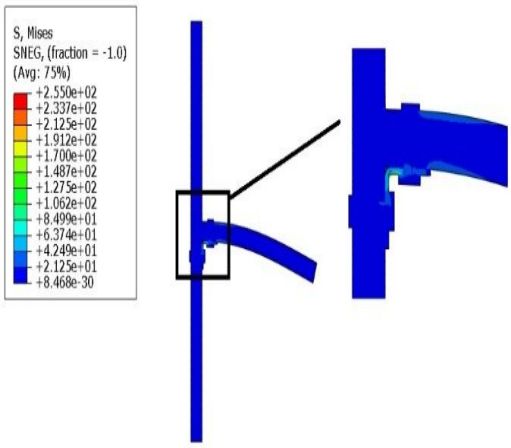

Figure 5- Tension distribution in wood structure (Mpa)

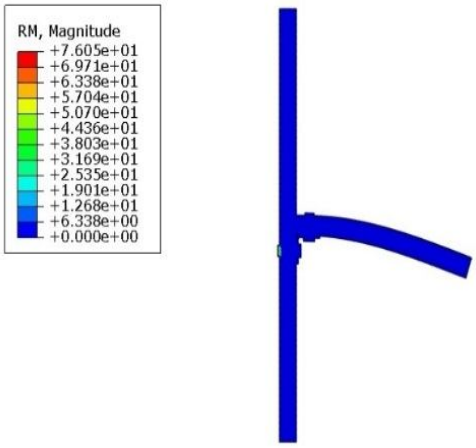

Figure 6- Bending moment distribution in wood structure (N/mm)

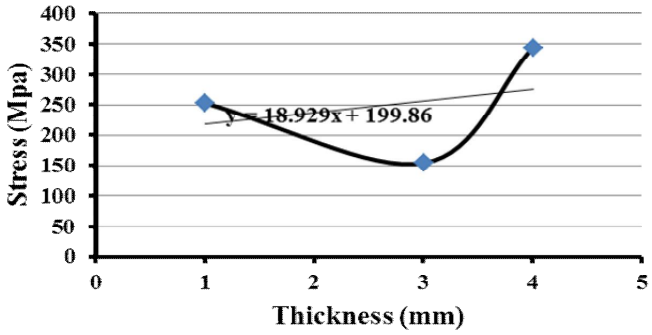

Figure 7- The changes of tension distribution with the increase of elite thickness

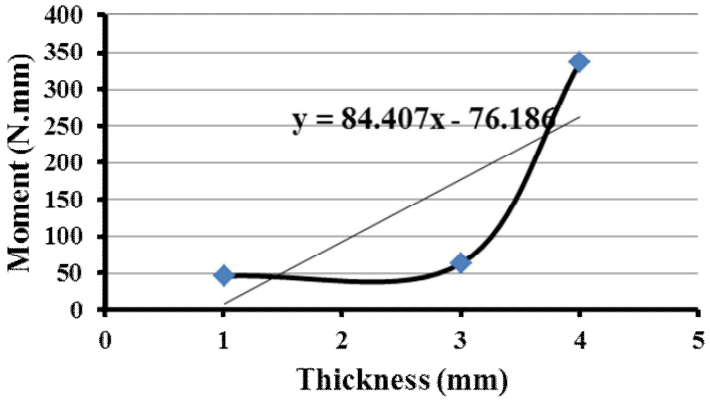

Figure 8- The changes of moment with the increase of elite thickness

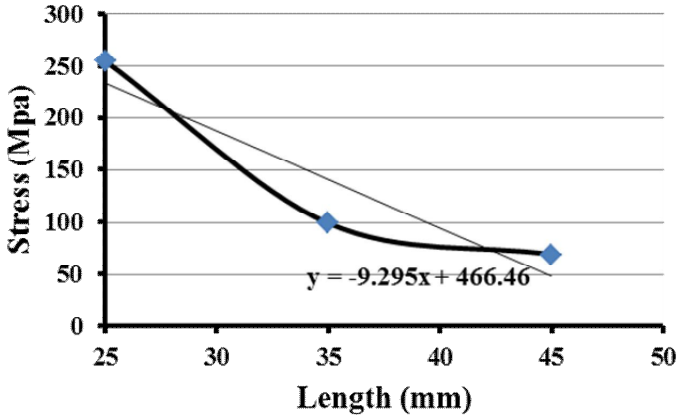

Figure 9- The changes of tension distribution with the length increase

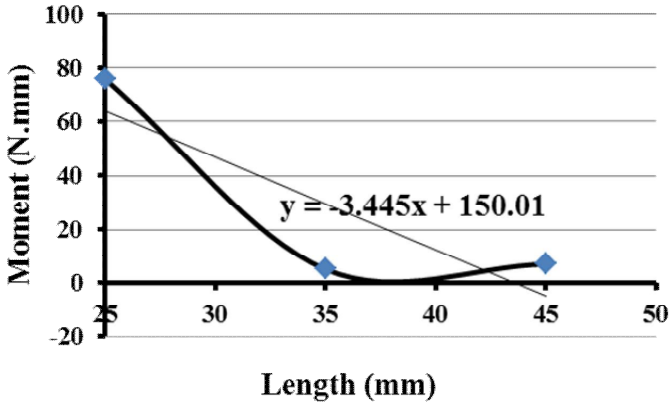

Figure 10- The changes of moment with the length increase

Table 1- Mechanical properties of Fir [i]

Compressive strength perpendicular [MPa] to grain	**Compressive strength Parallel to [MPa] grain**	**Tensile strength perpendicular [MPa] to grain**	**Poisson coefficient** ν			**Elasticity (E) module [GPa]**			**Wood species**
$\sigma_{c(Perpendicular)}$	$\sigma_{c(Parallel)}$	$\sigma_{t(Perpendicular)}$	ν_{xy}	ν_{yz}	ν_{zx}	E_x	E_y	E_z	
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Table 2- The mechanical properties of applied steel in elite, bolt and nut fastening

Compressive strength Parallel to [MPa] grain	**Poisson coefficient** ν	**Elasticity module (E) [GPa]**	**Steel**
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RESEARCH ARTICLE

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ABSTRACT

In analysis of tension distribution in joint structure of two sides of corner elite of metal, bolt and nut, the empirical method with finite elements is investigated. In this analysis, the effect of elite thickness (1-3-4mm) and elite length (25-35-45, 55mm) was evaluated on tension distribution in composition joint of metal corner elite and bolt and nut. The results showed that by increasing elite thickness, of two sides of elite, tension was reduced by increasing the length of two sides of elit, t first it was increased and then, it was reduced.

Key words: Finite elements, Elite joint, Tension.

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Also, mechanical properties of elite metal joint of steel are shown in the following Table.

Loading and boundary conditions

In the following Figure, a view of loading and boundary conditions is shown.

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The numerical analysis on thicknesses 1,3,4 mm of join of two sides of elite is performed.

The effect of elit length

The effect of two side elit length (25, 35, 45, 55mm) on tension distribution and bending moment capacity of wood is shown as followings

RESULTS AND DISCUSSION

In the following Figure, the changes of distribution of tension and moment with the increase of thickness of two sides of elites are shown.

In the following Figure, the changes of tension and moment distribution with the increase of elite length of two sides are shown

CONCLUSION

The results show that in tension and moment distribution changes, by increasing length of two side elite, at first tension is increased (35mm), then it is reduced (55mm), moment changes by increase of elite length are sensual and by increase of length, at first they are reduced (35mm), then increased to length 45mm and again they are descending and reduced. The results of changes of tension distribution by increase of thickness of two side elit, tension are reduced linearly. The moment changes are increased by increase of two side elite thickness.

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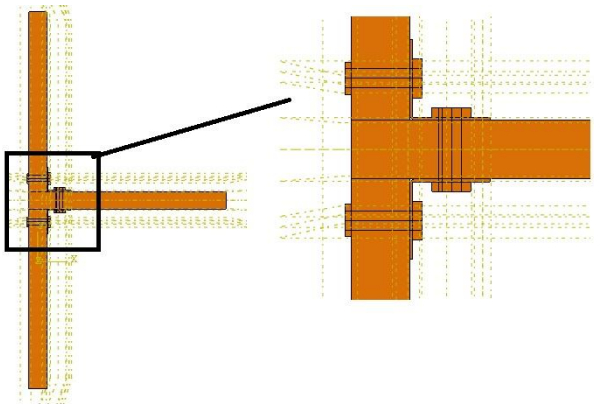

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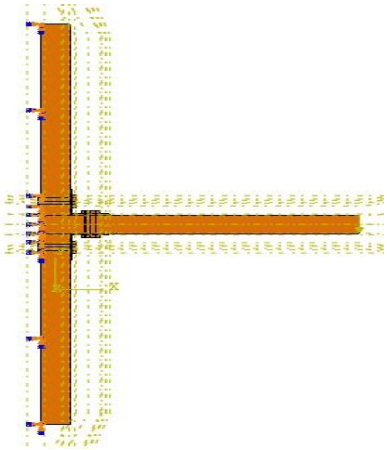

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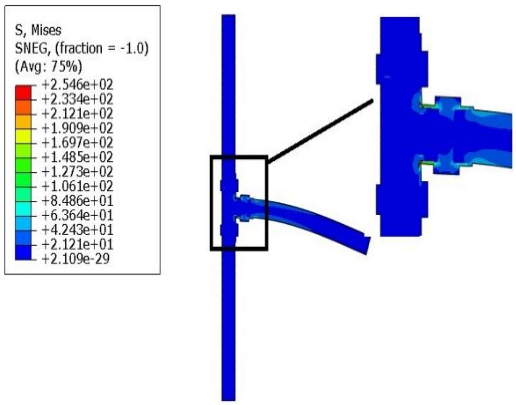

Figure 3- Tension distribution in wood structure in Mpa

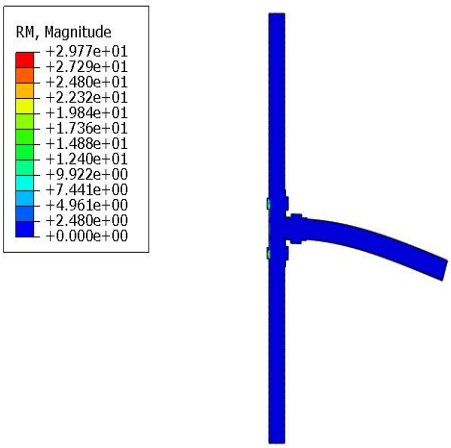

Figure 4- Bending moment distribution in wood structure in N/mm

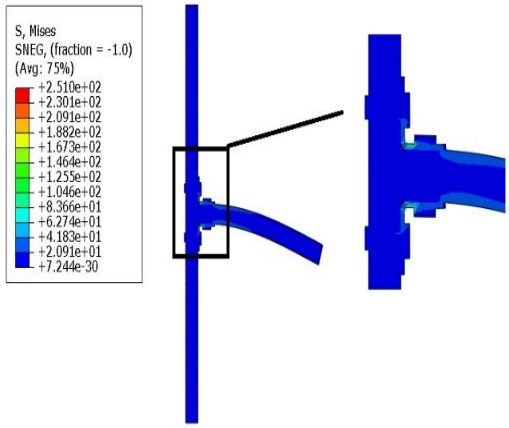

Figure 5- Tension distribution in wood structure (in Mpa)

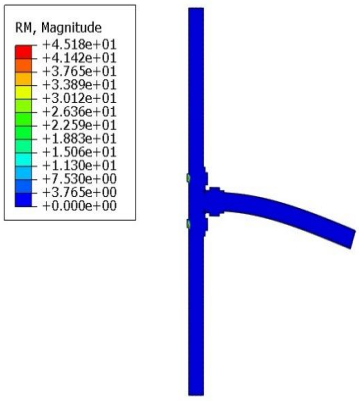

Figure 6- Bending moment distribution in wood structure

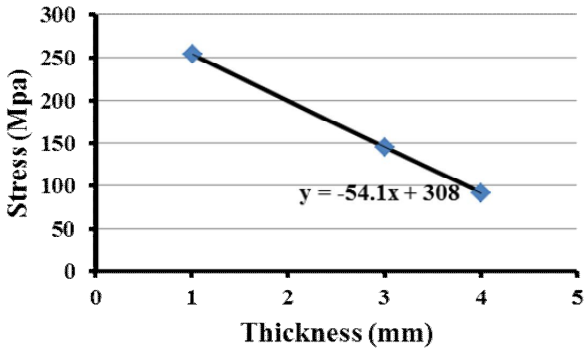

Figure 7- The changes of tension distribution with the increase of thickness of elit

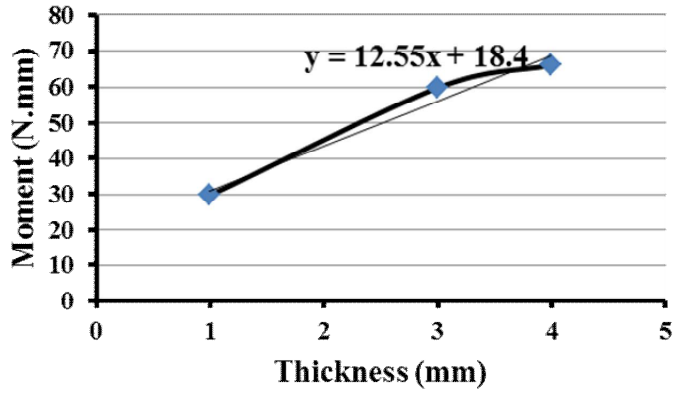

Figure 8- The moment changes with the thickness increase

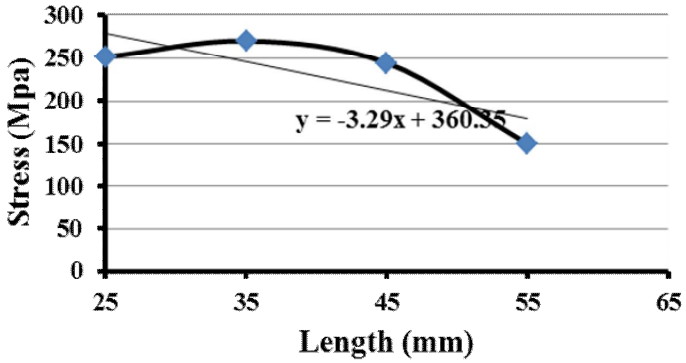

Figure 9- The changes of tension distribution with the increase of elite length of two sides

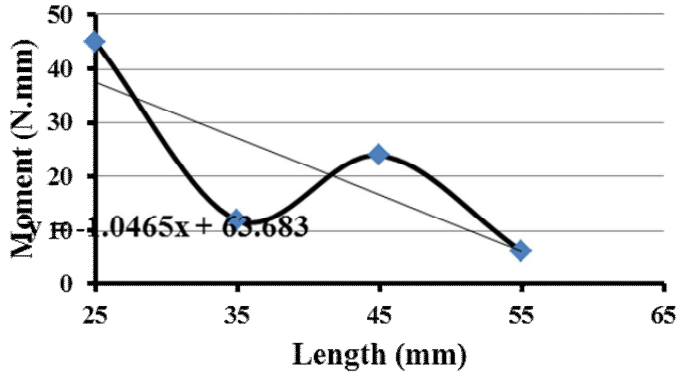

Figure 10 The changes of moment with the increase of two sides elite length

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Compressive strength perpendicular to grain] MPa[	**Compressive strength Parallel to grain] MPa[**	**Tensile strength perpendicular to grain] MPa[**	**Poisson coefficient** ν			**Elasticity module**)**E**( ]**GPa**[			**Wood species**
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RESEARCH ARTICLE

A Novel Predication-Based Approach for Target Tracking in Wireless Sensor Networks

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ABSTRACT

With the development of technology design of electrical circuits, low size and cost electronic component is provided. This development is the reason of emerging wireless sensor network and its daily advances during last decade. Wireless sensor network consists of hundreds or thousands tiny nodes called sensor nodes with are connected to each other and work together in order to do some special tasks. Target tracking is one of the important issues with is considered in to account in last few years. There are many researches and various algorithms have been proposed. Among these algorithms, the approaches that predict target location in next time interval using special techniques are more efficient. By prediction of next target location, the number of involved nodes in tracking is reduced and consequently energy consumption will significantly reduce. We in this paper propose a prediction method that a few nodes are activated in order to tracking the target and others are in sleep mode. According to simulation results, the proposed method in addition to increase accuracy in tracking the target, can satisfactory decrease energy consumption compared to the previous methods.

Key words: Wireless sensor network, Target tracking, Prediction method.

INTRODUCTION

Wireless sensor networks (WSNs) are consist of large number of nodes with limited processing and wireless communication capabilities and detection of one or more physical or chemical phenomena[1]. Wireless sensor networks, primarily for monitoring extensive areas include phenomena are identified and tracked moving targets. Target tracking is one of the main challenges in wireless sensor networks.Various methods for tracking targets, taking into account various criteria such as scalability, communication overheads, energy consumption and target tracking accuracy were investigated[2-4].In a general classification, Bhatti and et, [5]classification target tracking methods in to clustering based, treebased,Mobicast message based, prediction based and hybrid.In tracking algorithm based on prediction, next position of the target is predicted with respect to the speed and current target path.Accordingly,nodes in other areas before reaching target to that area are active and after passing target through the area,the nodes return in sleeping mode. Sleeping mode in these approaches is a case that in it node does not track any target and sensing. Therefore, its entire sensing components turning off and just radio communication component are in Idle and waiting for signals from other nodes till return in tracking and monitoring mode [6]. Also, nodes that are not placed in target path remain in sleep mode so energy remaining in the network will significantly reduce.

In this paper aim is to propose a prediction based tracking algorithm that decreases the number of involved nodes (active nodes) withoutreducing the tracking accuracy. In order to achieve this purpose, the proposed algorithm will active sensor nodes using position prediction of target area in next time interval according to the location, velocity and acceleration of the current target. The area of target position in the next time interval is considered as a circle with radius approximately proportional to the speed and centered at the coordinates of the current target.We try to active nodes just in this area, because nodes in this area will involved in tracking in next interval. The nearest sensor node to target in our proposed method constructs this area and broadcast activated message through it. Therefore, the proposed method reduces number of activated nodes and just active required ones. It is obvious that reducing active nodes lead to reducing energy consumption and prolong the network lifetime. Since the proposed method does not discard required nodes in tracking, the tracking accuracy will remain in high level.

The rest of this paper is organized as follows: in Section 2, some related worksare reviewed. Section 3 presents themain contribution of this paper, the adaptive sensor activation algorithm. Simulation results and detailed comparisonsare presented in Section 4. Finally, concluding remarks aregiven in Section 5.

Related works

The classification of target tracking is based on clustering or based on tree structure. Each of these approaches can either use prediction or not. The clustering approach is divided into three classes; static, dynamic and hybrid. By combining each class with prediction will significantly save energy if the accuracy prediction of the next location of the target. If the prediction is incorrect, probability of missing the target increased and the target retrieval algorithms will be needed.From the perspective of processing and network structuring algorithms can be divided into two categories: distributed and centralized. In centralized manner, one node (or a central entity) obtained entire network information (By assumption that all nodes send their data to this central node) and them the optimal structure (tree or cluster) is constructed according to global information. In distributed manner, nodes by interactive information among their neighbors construct desirable structure for tracking. It may be the structure created by distribution methods will not optimal. However, the use of local information is greatly reduced information exchange overhead and energy consumption, so that using a centralized method of tracking is not effective. Our proposed method is a prediction based and distribution approach.

One of the best distributed and prediction based tracking approach is presented in [7] called DSA. Since this approach is one of the robust tracking techniques, the superiority of the proposed method to DSAis reason for the effectiveness of our method.In addition to DSA, the naïve [8] approach is used in simulation results and comparisons. In naïve approach, all sensor nodes are in active mode and there is no technique is taking into account for energy saving. DSA is distributed flow briefly.

In DSAin order to reduce energy consumption, active/sleeping technique is used.The binary-detection sensing model is considered in this paper, which means that the sensor can detect the target onceit comes into the sensor's scope. A disc of radius Rs is assumed as the sensing scope of each sensor. Formally,the model is given by

$$S_i(T) = \begin{cases} 1, & \text{if } d(S_i, T) \le R_s(i) \\ 0, & \text{otherwise} \end{cases}$$

Where Si (T) is the sensing result of the sensor si for thetarget, and d(si ,T) is the distance between the sensor si and the target T. The communication model is similar to the sensingmodel, but the scope is generally a little larger, as is shown inFig. 1, where Rc is the communication range of the sensor.

Assume all the sensors work in three modes: communicating, sensing and sleeping. For thecommunicating problem,some sink sensors are necessary to transmit and receivemessages to guarantee the communication for every sensor.Therefore, all the sink sensors would work in communicating mode except when they need to detect the target. Whilethe normal sensors can work in the sensing mode to detectthe moving target or the sleeping mode to save energy.

As Fig. 2 shows, thetarget is detected by three sensors marked as stars. Thenwake up messages are broadcasted to the one-hop scope (the green scope), some of the sensors in this scope (whose radio-triggers are on) are awaked to sense the target. So the wholeactivation scope can be as the solid circle. Meanwhile, theseawaked sensors inform the sink sensors around them (thegray scope) to begin sensing too. The whole activation scopeis then enlarged to the dashed circle.This process is repeated until the end.

Proposed approach

In our model (see Figure 1), weassume that the communication range of sensor nodes isRc,and Rs is the sensing range. In order to guaranteethe direct communication between the nodes which cansimultaneously monitor the target, we define Rc = 2Rs.Sothe sensing region is defined as d<Rs and communicationregion is defined as d<Rc.

For single prediction strategy, due to the uncertainty andunpredictability of real-world targets' motion, it is difficultto guarantee high accuracy of the prediction. Therefore,we predict the moving region of target in the next timeinterval instead of predicting the accurate position. To reducethe number of nodes that are involved in tracking thetarget and guarantee the target can be detected in the nexttime interval, we active nodes in target region in thenext time interval, as Figure 2 shows.

Assuming a maximum target speed, the proposed schema is described based on Figure 3.Draw a circle with radius T and center of the target, the target region is determined that there will be a next step.To activate the sensor nodes in each step this mechanism is used. Node closest to the target, which is also the symbol of the circle is plotted in figure 3, actives nodes which target are in their sensing range in next time interval. The closest node is selected because the cost of other nodes activation in next step becomes minimum. Communication range of each sensor nodes is considered as R (R_c). The closest node in order to coverage target movement area in next time interval should send wake up message with T+d radius. Here d is the distance between target and closest node. The area that received

wake up message is shown in figure 4. The wake up message consists of information such as target location and activator node (closest node to target). Each node makes a decision about waking up or not after receiving wake up message by using following condition:

If $(nodeavtivator.x+node.x)^2 + (nodeactivator.y+node.y)^2 \leq (T+d)^2 \&\& (target.x+node.x)^2 + (target.y+node.y)^2 \leq (T+d)^2$
then node is active.

In this condition nodeactivator is the node that actives other nodes and node is a normal sensor node with (x,y) location. The target and activator node have their x,y location.

SIMULATION RESULTS

We in this chapter evaluate proposed method and some other algorithms. Here due to similarity between our schema and DSA, the proposed method is compared with DSA. Since DSA is a robust approach in target tracking, illustration of priority of our approach over DSA is shown the efficiency of the algorithm. The Matlab software is used for simulation and initial parameters are setup as follows:

Node Initial Energy=5J
Rs=30m
Rc=60m
Network=500*500
Nodes=250

We focus on the energy consumption as performance bycomparing our energy consumption results with distributedsensor activation algorithm (DSA) and Naive method, where each sensor node monitorsits sensing range all thetime and reports the location of target to the sink nodeperiodically [8]. Figure 5 shows the simulation result of increasing sensingrange.We run the test with 250 sensor nodes, and we increasethe sensing range from 50m to 80m in increment of 10m. From the result, we can find that the total energy consumption in our approach is much less than the consumptionenergy of Naive and DSA2 approach.

Figure 6 shows the effect of deploying different sensornodes on the total energy consumption of our approachand other existing methods. We set the sensing range of thenodes at 30m, communication range at 60m. The sensornodes are varied from 200 to 500 in increment of 100 nodes. The effect of large number nodes isalmost the same with large sensing range, and the energyconsumption slightly increases with the increase of the sensornodes.

CONCLUSION

Focusing on the energy problems in the target tracking of wireless sensor networks, we propose an energy efficient sensor-activated strategy. Due to the uncertaintyand unpredictability of real-world targets' motion, it isdifficult to guarantee high accuracy of the prediction byusing traditional prediction strategy. In this paper, we predictthe moving region of target in the next time intervalinstead of predicting the accurate position. Thenwe establish an activated strategy to activate the fewestessential number of sensor nodes within the next target movement region to monitor the target's location in thenext time by analyzing the position relation between thetarget and the nodes. The proposed algorithm can reducethe number of nodes being involved in tracking the targetto prolong the network's operational lifetime. Simulationstudies show that the proposed algorithm provides significantenergy savings.

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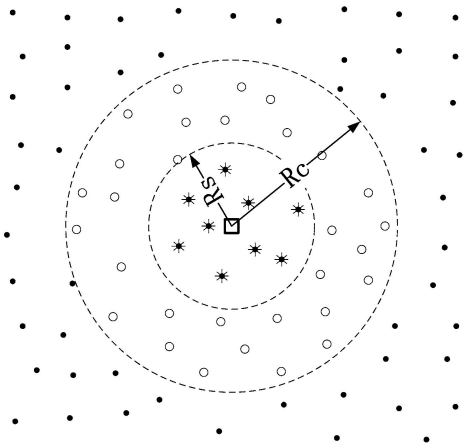

Figure 1. Sensing model and communicating model

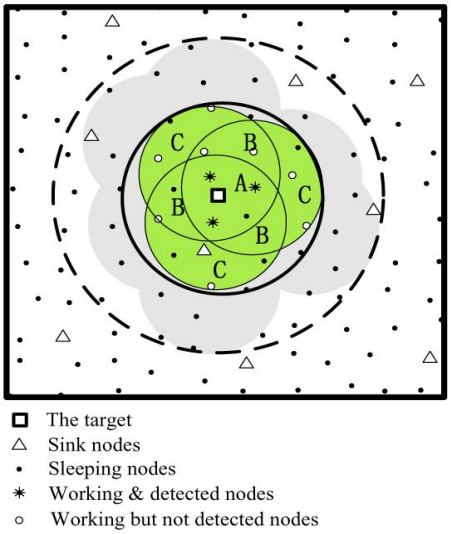

Figure 2. The algorithm for activation

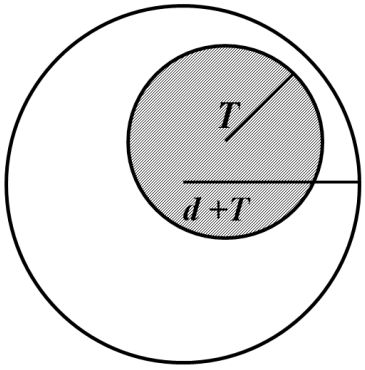

Figure 3. Activation area

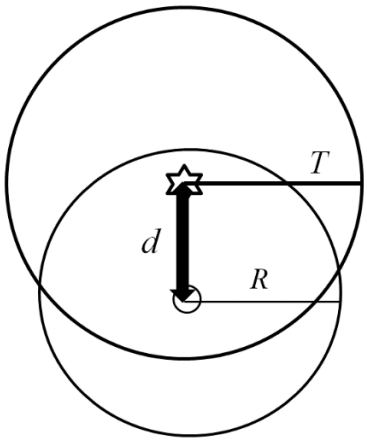

Figure 4. The target and closest node to it

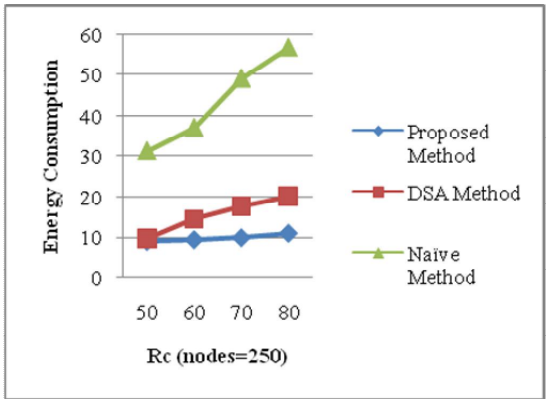

Figure 5. The relation between energy consumption of theproposed approaches, DSA2 approaches, and Naive for differentsensing ranges

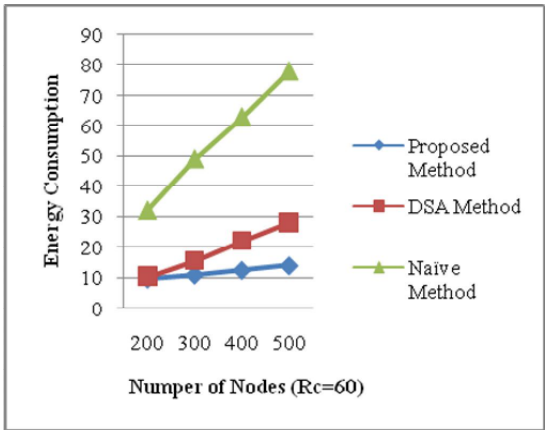

Figure 6. The relation between the energy consumption and network nodes in the proposed approach, DSA2 approach and Naive.

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RESEARCH ARTICLE

Semi_M Method for Property Diminution Based on Asymmetric Clustering of Properties in the Issue of Spam Diagnosis

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ABSTRACT

One of the methods of spam diagnosis is grouping of emails into two categories of spam and non-spam. The high efficiency of the methods based on machine learning, has an important role in development of these kinds of methods. The mechanism of grouping based on machine learning takes place according to emails properties. Using an efficient properties diminution algorithm has an important role in emails grouping because of high content received emails. In the present article, a new method to diminish properties based on properties grouping is stated. According to the proposed algorithm, the properties are asymmetrically divided into two forms- multiplex cluster and uniqueness cluster. Two methods have been used in order to break the properties that the first method is based on document repetition and the second method is based on PBIL. Multiplex cluster includes low valued properties and uniqueness cluster includes high valued properties. The main focus of this algorithm is on multiplex cluster. After grouping the properties, every cluster including a set of properties should be mapped into one property. Mapping methods are divided into two general categories-simple combination and advanced combination. In simple combination, the outcome property of a cluster is gotten from the sum of that entirecluster's amount.In the other words, from the point of view of simple combination a property of a cluster has the same role. In multiplex combination, an equation has been used that can somewhat view dependency between the properties so that it can extract existence or non-existence pattern of properties of a cluster in a special class. So, regarding the methods of division and combination of properties, four clustering mechanisms are proposed. One of the proposed methods is Avg-semi-M method that is the

mean of the methods of properties grouping based on the superior properties. This method is one of the methods based on advanced combination; therefore, it has better operation than other methods.

Key words: Spam, Classifier, Property Diminution, PBIL, Document Repetition, Clustering.

INTRODUCTION

Hitherto, many machine learning methods for the issue of spam diagnosis based on the content have been used. Machine learning methods that precede grouping of emails based on the content are in a way that emails' contentis become a set of words (properties) and usually the number of repetition of each property is viewed as amount of that word. If the number of these properties is low, grouping operations are done according to all of them. In some issues that the number of these properties is very high, property diminution should be proceeded in order to diminish complexity and to avoid convergence problem.

Property diminution can be generally performed into two ways

In the first method, a set of superior properties have been selected according to a special parameter and the rest of properties are discarded. In property selection, it is indeed attempted to select the best subset among possible 2N subset of properties. Hitherto, according to different parameters of property selection, various property selection methods have been stated that a sample these methods can be seen in Nouman Azam….. .

Although, the purpose of the property selection is that the vector dimensionsare diminished in such a way that there is no considerable diminution in accuracy and validity of grouping prediction and distribution of all properties, it is possible that non-selected properties have helpful data for diagnosis among classes and the efficiency of classifier diminished practicallyby discarding them. On the other hand, spammer can compass filtering with the discovery of superior properties and not using them in emails.

In the second method of property diminution, instead of the selection of a set of superior properties, it is attempted to do the superior properties selection operation by changing the primary sector space to a new space without diminution of the number of properties. The method of this work is in a way that all input property sector is firstly removed to a new space, then the best property set is selected from this new space. Therefore, every final property in this method is a function of input properties. This causes that spammers are not able to diagnose this property and cannot confront it easily. It causes the increase of robust of our model than noise so that mechanism diagnosis becomes more difficult by spammers.

Methods based on transfer are divided into linear and non-linear in which one or more properties (or all properties) from the previous space combine with each other and make one or more properties by the new space. That these properties on which bases combine with each other, the number of combinational properties, quality of combination, etc, cause the creation of different methods of property diminution based on transfer. Nonlinear methods are more complex than linear methods, so nonlinear properties are not discussed here. From linear methods, RP6, ICA5, PP4, PCA2 can be mentioned.

PCA method that also has application in the field of pattern detection and image processing is one of the best linear methods for property diminution. The reason is that the data ignored during the process of transfer is less than other methods. Also, FA displays several random variables called factor, by less number of these random variables. Unlike FA and PCA methods, PP method combines data with the rank of more than two with each other. In ICA method,

linear mapping takes place based on vectors not necessarily perpendicular on each other. RP is a simple and strong method that transfers operation based on random matrixes.

The suggested diminution property method in the present article, talks about a new method based on transfer in which the properties are clustered first, then each cluster is mapped to a property. Therefore, suggested method in this article can be considered as the second category of diminution property method in which each property obtained from combined set of properties of one cluster. That the properties clustering process are operated on which base is one of the important issues that two clustering methods are investigated in the present article. Also, the quality of properties combination of a cluster is another important issue that two ways of properties combination are investigated in this part. So, regarding to the quality of clusteringand properties combination of a cluster, four proposed methods are investigated and analyzed.

The second part investigates the general process of clustering based on emails learning. And base Bayesian is expressed as base classifier. In the third part, PBIL algorithm that is used in the proposed method for properties clusteringis investigated. The fourth part describes the proposed property diminution method based on clustering. In the fifth part, the proposed algorithm is stated. In the sixth part, assessment and analysis of the proposed method are discussed, and at last the seventh part discusses about the conclusion and suggestions.

Clustering based on Bayesian

The methods based on machine learning that perform the operation of emails clustering according to the content have three general stages. The first stage of operation is pre-processing in which the affectless words are omitted, the words are rooted and each email is displayed as a set of words. There are lots of methods for displaying the properties that the method of repetition of word (TF) for displaying the data has been used here amount of which is equivalent to "the number of occurrence repetition of one word (feature) in one message (text). After displaying the data in a desirable way, the diminution property operation for optimization of the selected properties is used in the last stage. And at last, clustering operation based on these properties are performed. The purpose of this article is to present a property diminution method based on clustering that will be discussed in the next part in details.

Although, many machine learning methods like support vector machine, neural network, k-closest neighbor, boosting trees for emails clustering have been applied Bayesian is used specifically in commercial application and open-source. The cause of this may be its simplicity that has simple implementation. Also, its linear implementation complexity and high accuracy cause it to be able to compare with other machine learning algorithm. For this reason, base Bayesian is used as base classifier. Base Bayesian is one of grouping methods. According to this method, it is assumed that properties are independent from each other. In Bayesian theory, the probability that a message with property vector of x=<x1,….,xm> belongs to c class equals with: (1)

In this relation, p(c) equals with priori probabilities of c class, p(x/c) equals with the probability of that x appears in c class, and also p(x) equals with p(c). (2)

That Cs is class spam and Ch is non-spam.

Algorithm

PBIL algorithm is an algorithm from EDA family of algorithm in which it is assumed that there is no relation among variables. This algorithm that is one of the simplest EDA is introduced by Baluja for the first time and it operates with displaying binary of people. Estimation of distribution algorithm (EDA) is a set of evolutionary computational methods that has a vast application in real world.

PBIL (as distribution estimation algorithm) as genetic algorithm starts to work with a primary generation and in each cycle of algorithm operation, some of the present algorithm are selected in order to build the next generation, but unlike the genetic algorithm it lacks mutation and merger operators. After the selection of people to build the next generation, distribution estimation operations are performed for that and according to that, it starts to construct children.Operators and selection in mutation algorithm has substituted by distribution estimation operations. This causes that father generation doesn't have a direct effect on the production of the generation of children rather just their distribution that leads to children construction. Code quasi related to PBIL algorithm has been displayed in figure 31. As it is seen in this figure, probability vector of p is formed with primary amounts of 0.5. Then, while ring is repeated until the termination condition isn't fulfilled. During each cycle of implementation of algorithm, the following steps are implemented:

With regard to line 1 of figure 1-3, M sample based on probability vector of p is constructed first. These samples with m length, in fact constitutes the present population. (The present population –unlike genetic algorithm- is constructed based on probability function of p not based on the previous population.

According to line 2 of the figure 1-3, probability vector of p is updated. The process of updating probability vector of p takes place based on sample with the most proficiency in the present generation. In updating equation of probability vector of LR, it is learning rate that is determined by user. In the last step, mutation operation also takes place on probability vector of p. In this equation, MS is amount of mutation in order to influence the probability vector.

As it is said in the above routine, PBIL unlike genetic algorithm of the new generation is determined based on distribution of that generation not based on the previous generation.

Quasi code related to PBIL algorithm

Among applications that PBIL algorithm has appropriate efficiency can mentioned combinatory optimization, additive clustering, and property selection. In the present article, PBIL algorithm is also used in order to property clustering operation.

Properties Clustering

One of the techniques that are used for optimization in plenty of science branches is clustering technique. The base of this technique is in this way that data that will be clustered is divided into different categories with the name of cluster. One of the most important applications of clustering in clustering topic is cluster ensemble. The method of cluster ensemble is in such a way that several clusters from a data base produce the same data and finally it merges them into one cluster with each other. Clustering operation are implemented in different methods from which properties clustering and educational sample clustering can be mentioned.

Before clustering operation, some issues should be determined such as clustering criterion, the size of each cluster, the number of properties that put in each cluster. The purpose of clustering criterion is if properties in one cluster have any relationship with each other and if there is a relation it is according to what criterion. For example, similarity or dissimilation in one special parameter can be special criterion for clustering (of course it is possible that the members of each cluster don't have any relationship with each other). Another important issue that should be determined in properties clustering is the quality of properties of one cluster to obtain equivalent property of that cluster. The general process of properties clustering operations is displayed in figure 2-4. According to figure 204, clustering processes can be generally divided into three steps including:

1. Division of properties into two branches including those that are in multiplex cluster and those that are in uniqueness cluster. The point on which property vector is broken called failure point.
2. Implementation of clustering operation in a part that multiplex clustering should be done.
3. Combination of properties of each cluster in order to obtain equivalent property of that cluster.

Properties division

The first step in properties clustering based on figure 2 is properties division. As it was said, in this step the properties are divided into two sets of properties with high value and properties with low value. In figure 2, properties with high value are displayed with dark color and properties with low values are displayed with light color. In the set of high valued properties, we don't have any clustering rather all properties are viewed as uniqueness clustering and clustering operation takes place only in the set of low valued properties. (According to figure 2)

The percent of properties allocated to each of these two sets should be determined before implementation of algorithm. Then, the set of all properties should be divided into two categories. In this chapter,in order to divide property two strategies are viewed including:

Division of properties according to document repetition criterion.

In this method, properties percent allocated to each of two sets (high valued set and low valued set) are viewed as input that should be determined by user. Then, properties allocation processes to each of two sets begins (amount of which is determined by user). At first, properties are arranged based on document repetition and regarding to the input percent, the superior properties can be selected by three methods: the first method is the selection of upper half of the stored list (properties with the maximum amount of document repetition), the second method is the selection of lower half of the stored list (properties with minimum amount of document repetition) and the third method is the selection of central part of the stored list.

The general process of clustering

Primary property vector……..the first property

The second property n-property

Properties division

Divided property vector

Clustering

Multiplex clustering Uniqueness clustering

Combination

Property vector after clustering

Property with high value
Property with low value
Properties equivalent to one cluster

After selection of superior properties, the rest of the properties are viewed as a set of low valued properties. In proposed method in the present chapter, just the first and the third method have been used to divide properties and the second method has not been used. The reason of this is that in this method property with minimum amount of document repletion are viewed as superior properties that this work diminishes the efficiency of clustering method practically.

Properties division based on PBIL criterion

In this method unlike the previous method, the percent of allocated properties to each of two sets is not determined by user rather this amount is determined by PBIL algorithm. It means that the selection of property, first, takes place by PBIL algorithm and the selected properties are allocated to a properties set with high valued by that, and non-selected properties are allocated to properties with low value.

All properties= properties set with high value=selected properties by PBIL
Properties set with low value= non-selected properties by PBIL

Clustering Operation

Clustering operation includes two important steps: determining the number of clusters (and determining the size of each cluster) and operations in which properties are divided into clusters. In following each of these two steps are discussed in details.

The number of clusters and size of each cluster

In clustering process considered in this chapter, there are two clusters:

*single clusters
*multi-member clusters

As it is clear in figure 2.4, properties with higher value are converted to single clusters and properties with lower value are converted to multi-member cluster.

Single clusters include one property in which there is no clustering operation rather the property itself is restored as the outcome property from cluster. Therefore, the main focus is on clustering in properties with low value. The number of clusters in this method is viewed as input parameter and the size of each cluster is also obtained by division of the number of all properties on the number of clusters.

Clustering operation

Clustering operation is done based on document repetition criterion and properties in which the amount of document repetition is closer to each other, put in one cluster.

Combination of properties of a cluster

After clustering the properties, each cluster that includes a set of properties should be mapped in one property. Mapping method used in this chapter are divided into two general categories of simple combination and advanced combination. The quality of any of these two combination methods are investigated in following.

Simple combination

In this method, property obtained from each cluster is obtained from the sum of all amounts of that cluster. Assume that one cluster includes k property as (x1,x2,……..xk). Mapping function that was selected for this work is as equation 3.

As it is seen in the above equation, amount of properties from each cluster equals with the sum of the amount of all properties that are in that cluster. By doing this, all properties putting in one cluster have the same value for diagnosis between clusters from the point of view of classifier. Now, this issue is raised that properties combination in one cluster and regarding them as one property cause diminution of the power of diagnosis between properties and as a result the accuracy of classifier diminishes.

But, against, there are strong points that the effects of them are more than this issue. These strong points are:

In property vector that obtains in educational phase without clustering, there are usually properties from all educational sample messages and when overlapping of these properties in educational samples are low, it causes that a few number of properties involve in the process of property vector construction of that message. As a result, when property vector test for each educational sample in the phase is made, possibly amount of most of the properties (especially for zero messages) are zero, but the possibility of all amounts of cluster to be zero is very low in clustering process. This causes to diminish the number of properties that are used by classifier and also computational cost and time overload diminish.

Advanced combination

In simple combination, properties combination takes place by using one pre-defined equation and from the point of view of a classifier; all properties of one cluster have the same role. In this part, an equation was used for properties equation that can somewhat view dependence between properties as it is possible to extract existence or non-existence pattern of properties of one cluster in one special class. These patterns can include two or more properties that amount of their occurrence in one message helps to determine the class of that message. In this part, our patterns are in their simplest state namely including two properties. Therefore, each cluster includes two properties that combine with each other according to equation 4.

That in this equation, x is amount of the first property and y is amount of the second property (each cluster includes two properties) of each cluster and min is minimum functionthat returns the smallest member.

Proposed algorithm

The proposed method is in this way that the primary property vector (outcome of the selection of primary property) according to property division methods is divided into two sets of high valued and low valued properties.In high valued properties, uniqueness clustering (clustering with the value of one) is viewed. In low valued properties, multiplex clustering (clusters larger than one) takes place. Then, properties of each cluster combine with each other (simple combination, advanced combination) and constitute final property vector. Of course, it should be noticed that property division is performed according to DF and PBIL criterion that in previous parts were expressed in details.

Assessment and Analysis

Used data bases: Used data base, for assessment of proposed methods including PU1 and PU2 are sets of personal emails. For this reason, in order to remain the contents personal, all words are replaced by one numerical username. The accuracy of clustering with famous decuple validation procedure have been measured and reported. In fact, in each testing, data set is divided into ten separate parts nad one load algorithm is implemented for each part. Any time, one different part is used as a testing set and other nine parts are grouped with each other and used in educational set. The accuracy of clustering (in testing set) is implemented in ten periods, and then it is averaged and returned as the accuracy of total data set.

These data bases in 7 are available. PU1 includes 1090 messages, %44 of which are spam and PU2 includes 710 messages, %20 of which are spam.

Assessment parameters

Each algorithm usually is raised with the purpose of implementation of one or more tasks and finally it is assessed regarding to what extent it could do the tasks in an optimized way. Therefore, regarding to the purpose of each algorithm, some efficiency parameters are raised for that algorithm that is infact a quantity for assessing in order to understand to what extent the purpose in mind is optimized. In order to assess the filtering of spam, several assessment parameters are usually presented.

One of the most important parameters in all issues is grouping of the accuracy rate of classifier accuracy algorithm that is defined as the following:

The number of all messages that classified in accurate way

----------3) Accuracy rate =

The number of the messages of all educational set

This parameter is determiner of the power of classifier algorithms, diagnosis and accounts as one of the most important efficiency parameters.

RESULTS ANALYSIS

In this part, we want to assess and investigate the operation of proposed method that during this chapter were discussed. According to what was said, clustering mechanism can be divided into four groups like table 1. This division takes place based on properties division criterion and the quality of properties combination of a cluster.

The criterion we investigate in thepresent chapter is algorithm accuracy rate in received messages grouping. The proposed methods that are analyzed in this chapter include five methods that were discussed in table 2. The purpose of proposed method of Propose-M is basic that were discussed during the chapter. Semi-M method is a method in which grouping operation takes place according to properties with high value (according to table1). In All-M method, grouping operation takes place according to total properties namely according to the set of properties with high value and low value. In the next two methods, averaged operation also has taken place among the proposed method and each of Semi-M and All-M methods.

In this part, every one of five explained method is investigated in table 2 according to clustering mechanism of table 1. So, in the following sub-division, each of five proposed method in mechanisms of told clustering is investigated. At last, pluralization of all of proposed methods in clustering mechanisms is discussed and the best method and the best mechanisms are expressed.

Methods in which property division takes place according to document repetition, fifty percent of properties were selected as superior property, the rest of them are viewed as low valued property. In the methods based on PBIL, the selection of this set is also out of our options. And the algorithm itself starts to determine it. Also, in methods based on PBIL, the number of the primary population equaled with 10 and algorithm is implemented in ten periods. Data bases of PU2 and PU3 have been used for investigation and comparison of told methods too.

Assessment of Df-Simple method

Conclusions from implementation of Df-Simple method in two data bases of PU2 and PU3 have been displayed in figures 3 and 4. In these two figures, in order to divide properties, the first method has been used. And the conclusions related to the third method have not been discussed here because of the lack of high proficiency (in accuracy rate).

In figure 3, the proposed method has the highest amount of accuracy of 80. In amount of 80, Avg-All-M method has the highest proficiency.

In figure 4. The proposed method in all cases has the highest amount of accuracy, except amount of 40. In these two figures, Avg-All-M is the best method after the proposed method.

Assessment of Df-Advance Method

The conclusions of implementation of Df-Advance method in two databases of PU2 and PU3 have been displayed in figures 5 and 6. In these two figures, the third method has been used for properties division and two times Avg-Semi-M method has the highest efficiency. In figure 6, Avg-Semi-M method has the highest efficiency in all cases. Therefore, in this clustering methodology, it can be concluded that using of Avg-Semi-M method has the higher efficiency than others.

Assessment of PBIL- simple method

The results of implementation of PBIL-Simple method in two databases of PU2 and PU3 have been displayed in figures 7 and 8. In figure 7, the proposed method does not have appropriate efficiency; against Semi-M method has the highest efficiency in all cases. In figure 8, the proposed method is also the best method for just two times, and in other cases, other methods have the highest efficiency. The results obtained from these two figures are that the proposed method in the mechanism of PBIL-Simple clustering does not have appropriate efficiency.

Assessment of PBIL-Advance method

The results of implementation of PBIL-Simple method in two databases of PU2 and PU3 have been displayed in figures 9 and 10.

In figure 9. the proposed method has the highest efficiency in all cases except 40 percent of properties. (Of course, in some cases, the efficiency of some methods equals with the efficiency of proposed method, but it isn't more than that)

In figure 10. The proposed method has also the highest efficiency in all cases. The results obtained from these two figures are that the proposed method has an appropriate and optimized efficiency in this clustering.

General comparison of the proposed methods

Final pluralization of the proposed methods is in tables 3 and 4. Every cell of these tables shows the best obtained amount of accuracy (with clustering mechanism in which the best accuracy takes place) from the proposed method of that line instead of the percent of the selected property of that colmn.

It is observed in table 3 that the proposed methods in clustering mechanisms based on advanced combination of (Df-Advance and PBIL-Advance) have the highest efficiency and in table 4 the proposed method has the highest efficiency just in clustering mechanism of Df-Advance. So, advanced combination has the higher proficiency than simple combination.

Table 3) General comparison of the proposed methods regarding to mechanisms of different clustering in data base of PU2 (in each cell instead of the percent of selected properties and the selected proposed method, the best clustering method is stated with amount of accuracy of that clustering method)

Cells from the table specified with "___" means that told method in all clustering mechanisms has the same accuracy rate.

Table 4) General comparison of the proposed method, regarding to different clustering mechanisms in data base of PU3- in each cell, instead of the percent of the selected properties and the method of the proposed method, the best clustering method with accuracy amount of that clustering method have been stated-cells of the table specified with "__" means that told method in all clustering mechanisms has the same accuracy rate.

In table 5 and 6 the best proposed method that has the highest efficiency has been stated. In table 5, Propose-M and Avg-Semi-M methods have the highest efficiency and in table 6Avg-Semi-M method has also the best efficiency. So, Avg-Semi-M method has an appropriate efficiency in both methods and can be introduced as the paramount method.

CONCLUSION AND SUGGESTIONS

In the present article, several property diminution methods based on clustering were stated and investigated. The base proposed methd was in this way that the primary property vector (outcome from primary property selection) were divided into two sets of properties with high value and properties with low value. Then, uniqueness clustering (clustering with the size of one) was used in high valued properties and multiplex clustering (clustering larger than one) was used in low valued properties. In this way, properties are clustering. The, properties of each cluster combine with each other and constitute the final property. Properties division took place according to two PBIL and DF criteria and properties combination was also performed into two simple and advanced ways. Therefore, regarding to the quality of properties division and the quality of properties combination, there can be four clustering mechanisms that was stated and implemented in the present article. The results showed that methods based on advanced combination have the higher efficiency. Also, the results of implementation of the proposed method showed that Avg-Semi-M method (the mean of proposed method presented during this chapter and clustering method based on superior properties) has the highest efficiency. Suggestions for further research can be investigation for the other criteria for property division. Also, generalization of these methods to clustering aggregation methods can also be the combination of this research.

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Table 1. Four mechanisms of clustering used in proposed method

Executive mechanism	The name of the method
Properties division according to document repetition criterion by using advanced combination	
Properties division according to document repetition criterion by using simple combination	
Properties division according to PBIL by using advanced combination	
Properties division according to PBIL by using simple combination	

Table 2. Methods that are assessed in each part.

Executive mechanism	The name of the method
The main proposed method during this chapter	
The basic Bayesian method that uses superior properties	
The basic Bayesian method that uses all properties	
Averaged method between the proposed method and Semi-M	
Averaged method between the proposed method and All-M	

Figure 3. Investigation of accuracy rate in data base of PU2.

Percent of the selected properties	accuracy rate

Figure 4. Investigation of accuracy rate in data base of PU3.

Percent of the selected properties	accuracy rate

Figure 5. Investigation of accuracy rate in database of PU2.

Percent of the selected properties	accuracy rate

Figure 6. Investigation of accuracy rate in database of PU3.

Percent of the selected properties	accuracy rate

Figure 7. Investigation of accuracy rate in database of PU2.

Percent of the selected properties	accuracy rate

Figure 8. Investigation of accuracy rate in database of PU3.

Percent of the selected properties	accuracy rate

Figure 9. Investigation of accuracy rate in database of PU2.

Percent of the selected properties	accuracy rate

Figure 10. Investigation of accuracy rate in database of PU3.

Percent of the selected properties	accuracy rate

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RESEARCH ARTICLE

The Mediating Role of Organizational Justice in the Relationship between Transformational Leadership and Quality of Work Life

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ABSTRACT

The research aimed to study the relationship between transformational leadership and quality of work life emphasizing the role of intermediary variables of organizational justice, we examined. Accordingly, the present study is based on cross-correlation functions. The social health organization and related heath service centers in the Borujerd city are regarded as study sample. Using Cochran equation sample of 105 subjects stratified random sampling to select and data collection for this study three transformational leadership style questionnaire on bass and Olive standard plan in the form of 20 questions, Quality of life questionnaire work based on the 8-component model of Walton on a 30-question questionnaire justice Nihof and Moorman (1993), based on 3 dimensions (distributive justice, interactional, and procedural) in the form of 20 the question is, have they been. The reliability of instruments used by calculating Cronbach's alpha coefficient, respectively, for the three questionnaires, 0/809, 0/818 and 0/827 is calculated. Analyze data and test hypotheses using inferential statistics and tests for normality Kolmogorof-smirnof survey data and the Pearson correlation coefficient and multiple regression was performed using SPSS software. The results of this study indicated that confirmed the presence of a significant relationship between transformational leadership and employees' quality of working life and As well as the moderating role of distributive justice, interactional justice and procedural justice in the relationship between transformational leadership and employees' perceptions of the quality of working life.

Key words: transformational leadership style**,** quality of work life, organizational justice

INTRODUCTION

Whether in industry, commerce or office, managers are considered as most important and effective persons. Manager's behavior, from low to high levels of management, rather than any other factor influences the effectiveness and stuff spirit, and inferiors are seeking abstract of guide lines and policy of the organization in managers and their behavior, as well (Farahani, 2008, p 53).

Therefore, it is normal that recognition of human structure by the managers and their positive effects on this structure in the form if modern and effective leadership could lead to productivity and performance improvement of the employees and organization. The leadership and behavior style is an issue which has attracted researchers and common population for a long time. Perhaps the cause of extensive attraction of the leadership is that leadership is a so mysterious process which is exists in all people life. In most cases the behavioral Scientifics have tried to understand that the power of leader for influencing on followers and achieving group targets could be determined based on what specifications, behaviors, power sources, or on rely on what aspects of the situation (Yokel, 2000, p 11). Among different styles of leadership, the transformational leadership style, has tried to make move its followers in a circulation above the temporal benefits, with emphasis on ideal penetration (Charisma), inspiration or education provoking, or improving supports. This leadership promotes its followers in such a manner that achieve to higher levels of proficiency and idealism, exercise more endeavor to achieve to excellent results and self improvement, and think to the organization and society proficiency (Bass, 2000, p 11).

For this purpose, leaders in their leadership platform try to utilize all capabilities and capacity of the stuff and activate their potential aptitudes. Aiming that, they have to necessarily create opportunities, facilities and appropriate work place for the stuff, concurrently. This purpose is not possible, except with virtual recognition of needs and current conditions in work place and factors that cause to increase their performance. In the other word, appropriate use of human resources relies on adopting some positive and constructive activities which provide full or relative satisfaction of the stuff in the organization. Otherwise, these activities not only do not increase their performance, but the organization may move in the opposite direction. These activities are discussed under the title of work life quality in the organizational issues. In the organization and its leadership point of view, focusing on the stuff as the most important value and property of the organization is a phenomenon which has significantly improved in last 2 decades, and many studies have been conducted around that (Dolan and Shoulder, 2002). Therefore, the aim of present study is to examine the relation between transformational leadership and stuff life quality, with emphasis on mediatory role of the organizational justice from the perspective of national health organization of Boroujerd city.

PROBLEM STATEMENT

While in the past there has been only emphasis on personal (not work) life. today, improving work life's quality is one of the most important aims of the organization and persons who work for organization. Work improvement in the recent society has became as on of the most important targets of organization and stuff. Since there is direct relation between human resource management procedures and work life's quality, so resurrecting of stuff by improving their work life, is the key to success for any organization (Hoseinzadeh and Mirzaee, 2007, p 18)

As Richard Walton, the theorisian of the work life quality concept says: the work life quality is, the level of capability of an organization stuff to satisfy their own important personal needs in the organization via their experiences, which these experiences have significant importance in interaction between work place and organization (Tabarsa and Falah, 2009, p 108). This issue is TRUE while the success of any organization in achieving predefined targets besides having effective stuff is depended on circumstance of management adapting and the successful leadership styles of the manager. God behavioral models of the manager in every organization result in strong spirit and motivation in

stuff and increase their satisfaction of own job and profession. Beside different managerial and leadership styles are exist, such as: dictatorship style, rule oriented style, political style, and people oriented style, the revolutionary management and leadership style is proposed as a novel theory in this concept. As Robbins (1991) believes, researches show that the revolutionary managers can expand the stuff desires in direction of targets and massage of organization (Ansari, Teymury, 2007).

In this regard, Bass and Alive believe that when transformational leadership which the leader improves and enhances his stuff's desires, influence on stuff recognition improvement about their working situations, create awareness and acceptance of mission and destination for group and motivates stuff to see group benefits beyond their own benefits (Stone et.al, 2003, p 2).

In a global perspective, performance and circumstance of the managers' act and react in the form of their managerial style put a multilateral effect on the stuff, and even influences their emotions, feelings and thoughts in their cognition of work life (Riju, 2004, p 224). In this regard, Jelit et.al (2013) has demonstrated that there is significant relation between transformational leadership and quality of work life.

In the other hand, one of the organizational important factors, considering justice and equity, which can influence the quality of work life and explain the result of justice in organizations is considered as one of the adjusting variables in this study.

Different studies such as Cohen, Lid and Tyler,…. have illustrated that organizational justice influences different attitudes, insights and behaviors such as job satisfaction, organization commitment, job performance, cooperation and civic behavior (Hashemi and Beshlideh, 2010). The fundamental connections which justice experience and its appearances provide us, are varied and considerable in such extent that many philosophers of this area consider some kind of fundamental motivations for the justice. For this reason, in the work and organizational environments, the recognized justice has been proposed which according to Nihof and Morman (1993) point of view 3 form of distributional, interactive and procedural are regarded as precursor of stuff cognition from satisfaction and quality of organizational life (Golparvar et.al, 2010). These 3 aspects have been used in this study to evaluate regulator variable's effect of organizational justice, as well.

The results of related studies with variables of this study including Jilet et.al (2013) has shown that distributional and interactive justice have had mediatory role in the relation between transformational leadership and quality of work life. Also there is significant relation between quality of work life and job conflict of stuff. Regarding the importance of issue of leadership behavior and special concern about human resources of organization and quality of work life in the modern managerial issues, this study aims to examine the relation between transformational leadership and quality of work life, emphasizing on the mediatory role of organizational justice (as a significance on organization that the stuff have positive view from their work place and demonstrating good behaviors, put some big steps in achieving to organizational targets) from the perspective of the stuff of social health in Boroujerd city, as people who are involved in providing social insurance services to variety of people, and the level of their cognition of work life quality could has significant effect on their job performance, and regarding the importance of leadership behavior style and special concern about human resources of organization and quality of life, investigated the issue from the perspective of relation between organizational leadership style in the form of revolutionary style and the role that cognitions of stuff play in their organization. On the basis of this, the main question of study is that: is transformational leadership influencing on stuff recognition of their work life quality? And is stuff cognition of organizational justice regulates the relation between these tow variables?

Purposes of the study

Global purpose: to determine the influence of relation between transformational leadership and stuff quality of work life emphasizing of mediatory role of organizational justice.

In this regard the present study is trying to achieve discussed following partial targets:

Partial targets

To determine the role of regulatory variable of distributional justice in studying of relation between transformational leadership in stuff cognition about their own quality of work life.

To detect the effect of regulatory variable of interactive justice in studying the relation between transformational leadership in stuff cognition about quality of work life.

To detect the role of regulatory variable procedural justice in studying of relation between transformational leadership in stuff cognition about their quality of work life.

Hypothesis of the study

Global hypothesis: There is relation between transformational leadership and quality of work life of stuff.

Partial hypothesis

1. Distributional justice regulates relation between transformational leadership and stuff cognition about quality of work life.
2. Interactive justice regulates relation between transformational leadership and stuff cognition about quality of work life.
3. Procedural justice regulates relation between transformational leadership and stuff cognition about quality of work life.

Conceptual definitions

Transformational leadership style: Bass and Avellio (1999) have explained the conceptual virtue of transformational leadership as such: transformational leadership is leadership performance which tries to put its followers in a higher circuit beyond the temporal personal benefits, by ideal penetration (charisma), inspiration, education excitation or improvement supports. This leadership promotes its followers in such a manner that achieve to higher levels of Idealism and proficiency, adopt more endeavor to get excellent achievements and self improvement, and think to organization and society enhancement (Bass, 1999:11).

Quality of work life (QWL): is the organization stuff imagination or cognition or concept about work place physical and mental optimism (Mirsepasi, 1383:48). Quality of work life, in another definition is the stuff response toward the work, specially it emphasis on its personal outcomes in job satisfaction and mental health, using definition of quality of work life on the personal outcomes, work experience and circumstance of improvement of satisfying the person's needs (Salmani, 1384: 16).

Organizational justice: organization justice focuses on processes and procedures that are specified by stuff whether they are treated fairly in the work place and whether the influencing processes on results and outcomes are fairly and impartial or not? (Zahedi et.al, 1390: 4).

Interactive justice: from Nihof and Morman point of view interactive justice includes some aspects of communication process such as politeness, honesty and respect among recourse and receiver. In the other word, interactive justice focuses on people cognitions about quality of interpersonal behaviors during procedures execution (Fani et.al, 1392: 17).

Procedural justice: is justice that define the impartial approaches used to determine received outcomes by stuff (Morman, 1991: 4)

To response initial question of the study, the operational model of study has been formed, inspired from Jillet (2013) with combination transformational leadership style based on Bass and Olivia's model with work life on the basis of Walton Model (Fig 1.2).

METHODOLOGY

Methodology is a set of credited (validated) and organized rules, tools, and ways for investigating facts, detecting uncertainties and achieving solutions of the problems. The methodology of this study is case study, because it focuses specially on a certain organization (social health organization of Boroujerd city) and study elements and variables and has defined circumstance of relation between them in a certain platform.

As the aim of this study is to examine the relation between transformational leadership and quality of work life emphasizing on the mediatory role of organizational justice variable, it could be say this study is a functional study regarding the target, since its results is used to inform managers and leaders about leadership styles, which may influence the quality of their work life and consequently improves their performance and eventually influence on more productivity of the organization.

Regarding that determining the attributes, characteristics and requirements and evaluation of stuff cognitions is done by referring them in this study, it could be mentioned that present study is a description- survey study based on nature and method, and investigates distribution of characteristics of research society, and describes the elements and variables of study, also describes their relations in specific framework.

Statistical sample

Statistical sample of the study includes total social health organization and its covered health services centers stuff across the Boroujerd city, which according to obtained data from 2 dependant centers of this organization and Ayat-Al-Allah Boroujerdi, entirely consists of 144 stuff, including managers and all stuff and experts of this organization.

Statistical sample volume and sampling method

In this study, to estimate selected sample volume using statistical formulations, the Kokran equation has been used:

$$n - \frac{t^2 \frac{p.q}{d^2}}{1 + \frac{1}{N}\left(\frac{t^2 p.q}{d^2} - 1\right)}$$

Where, p=0.5, q=0.5, d= 5%; the total statistical sample volume (entire stuff of social health organization in Boroujerd city) N=185 persons.

$$n - \frac{\frac{(1.96)^2(0.5)(0.5)}{(\%5)^2}}{1 + \frac{1}{144}\left(\frac{1.96^2(0.5)(0.5)}{(\%5)^2} - 1\right)} - 104.83 \cong 105 \text{ نفر}$$

So, 105 people were chosen as statistical sample according to above equation. Then, to achieve to study targets the data gathering tool has been provided to this number of samples, using random proportional stage sampling.

In this method, first samples are divided on levels and then the number of sample persons is determined in same proportion to levels among society (Khati, 1382: 367).

Data gathering method

In present study, in section related to theory writing and literature and theoretical proposal of the study, researcher uses library method (using books, national and international articles, researches and thesis). To data gathering in this study, the closed questionnaire is used.

In this section, questionnaire and appropriate questions for hypothesis test and research questions have been created using field research method to related data gathering and utilizing existing theories and articles about present study.

To data gathering required to study proposed of 4 sections questionnaire composed of demographic, transformational leadership style, quality of work life and organizational justice, in this study has are used, which distributing them among social health organization and related centers stuff across Boroujerd as statistical sample, we asked for their points of view and opinions about title of study.

Data gathering tool

The questionnaire was used to data gathering in this study. Researcher referring to resources and research books and surveying from respectful faculties, composed the relative questionnaire (standard questionnaire about study variables) and then getting advice of respectful faculties, has tried to compose the questionnaire in such manner that could be responsive for relative questions.

Validity and reliability of data gathering tool

Validity or credit: To examine accuracy and precision of study finding and their integrity with study hypothesis, first 70 questions of questionnaire (in the form of studding of 3 variables) before distribution in the statistical sample was

observed by respectful faculties, and after their confirming of its content validity 20 sample questionnaire were distributed among statistical sample to evaluate stability.

Stability or reliance

First 3 parts of questionnaire of study (transformational leadership, quality of work life and organizational justice) was distributed among 20 samples and its Alpha coefficient was determined before distribution among statistical sample, accordingly. On this basis, calculated Alpha coefficient for questionnaire parts, concerning that Alpha value above 0.7 is good value, showing good stability to evaluate entire determined variables for present study. In this study, descriptive and deductive statistical methods have been used to data analyzing.

Descriptive statistics

In this study to data setting in abundances distribution tables and drawing histogram charts of abundances.

Deductive statistics

Researcher in deductive statistics always selects a sample small group from a larger group called statistical sample, and researcher evaluates and predicts characteristics in studied society sample using obtained data and information from sample.

Regarding that this study examine relation between transformational leadership and quality of work life among social health organization stuff of Lorestan province, and in this study respondents tend to express their own personal evaluation about believe, or opinion, behavior, or emotion,... based on objective and subjective criteria which they have, in a response range between agree and disagree, a 5 degree Lichert spectra measurement has been used. Therefore, measurement indexes related to degree variables should be used in parametric analyzing.

In present study, to test hypothesis for evaluation of independent variable impact on dependent study variable and also evaluation of the regulatory role of social justice and studding relation level between dimensions of this variable and transformational leadership variables and quality of work life, correlation coefficient test and multi variable regression test has been used. On this basis, in this study has been done using concurrent analyzing of k number of independent variable and n number of dependent variable. In the charter 5, the obtained results of this study will be studied using statistical software.

Used software

In present study, after required data gathering for study via questionnaire, to perform statistical tests and analyzing, the Excel and statistical software SPSS are used. Researcher tries accordingly towards data analyzing and, using SPSS software and correlation analyzing using related software and statistical test, to determine existing relations between hidden variables and observed variables.

Hypothesis test

Main hypothesis

H0: There is no relation between transformational leadership and quality of work life.
H1: There is relation between transformational leadership and quality of work life.

To analyze this hypothesis the Pierson correlation test was used. Results have been illustrated in table 7.4.

Regarding results of main hypothesis analyzing of the study, examining the relation between personal cognition about transformational leadership and personal understanding about quality of work life shoed that there is a relatively strong, direct and significant relation between above tow variables (correlation is 0.63 and significance level is 0.005), means that as personal cognition about transformational leadership style in organization is more, personal understanding about own quality of work life will increase equivalently (because this factor is positive). Therefore, rejecting null hypothesis, it could be concluded that there is relation between transformational leadership and quality of work life of stuff.

First partial hypothesis

H0: distributional justice does not regulate the relation between transformational leadership and stuff cognition about quality of work life.
H1: distributional justice regulates the relation between transformational leadership and stuff cognition about quality of work life.
To study above hypothesis, the multi regression analyzing was used. The results of study are illustrated in table 8.4.

Results of proposed regression analysis in table 8.4 show that obtained significance level F, the 523.3 value, with freedom degree 2, 103 is less that 0.05 ($F_{(2,103)}$ =523.3, p=0.005). Therefore, regarding statistics the established regression model is significant. Also regarding R^2 value, predicting variables totally predict 48% of impact variance. The undiscovered value is about 52%. In the other word 48% of personal cognitions about transformational leadership style and quality of work life come from distributional justice in the organization and 52% is due to other factors.

To study level and direction of personal cognition about transformational leadership in organization and quality of work life, regarding cognitional distributional justice in organization, Beta coefficients were also calculated which the results of this study are illustrated in table.

As observed in the table 9.4 regarding Beta value, distributional justice has had significant impact on personal cognition about transformational leadership style in organization and quality of work life. This variable had 14% impact in cognition about transformational leadership style and 9% impact in personal cognition about quality of work life, which regarding significance levels of 0.000 , 0.003 of tow mentioned variables respectively, this value was significant. Therefore, rejecting first hypothesis it could be concluded that distributional justice regulates relation between transformational leadership and personal cognition about quality of work life.

Second partial hypothesis

H0: interactive justice does not regulate relation between transformational leadership and stuff cognition about quality of work life.
H1: interactive justice regulates relation between transformational leadership and stuff cognition about quality of work life.
To study above hypothesis multi variable regression was used. Results of this study are illustrated in table 10.4.

Proposed regression results are illustrated 10.4 which calculated significance level F, 326.1 value with freedom degree 2, 103 is less than 0.05 ($F_{(2,103)}$=326.1, p=0.001). Therefore, established regression model is significant regarding statistics. Also, concerning R^2 value, predictive variables totally describe 45% of impact variance. The undiscovered value is 55%. In the other word, 45% of personal cognition about transformational leadership style in organization and quality of work life is due to his/her cognitions about interactive justice in organization and 55% is due to other

factors. To study the level and direction of personal cognition about transformational leadership style in organization and quality of work life regarding personal cognition about interactive justice in organization, the Beta coefficients were also calculated which the results of this study are illustrated in table.

As shown in table 11.4 regarding Beta value, interactive justice has had significant impact on transformational leadership style and quality of work life. This variable is 8% for personal cognition about transformational leadership style and also 8% for personal cognition about quality of work life, which regarding significant levels of 0.0001, 0.0001 about tow mentioned variables respectively, this value is significant. Therefore, rejecting null hypothesis, it could be concluded that interactive justice regulates relation between transformational leadership and personal cognition about quality of work life.

Third partial hypothesis test

H0: procedural justice does not regulate relation between transformational leadership style and personal cognition about quality of work life.
H1: procedural justice regulates relation between transformational leadership style and personal cognition about quality of work life.
To study above hypothesis, multi variable regression model was used and results of this analysis are illustrated in table.

Proposed regression results in table 12.4 show that obtained significance level F, 198.1 value with freedom degree of 2, 103, is less than 0.05 ($F_{(2,103)}$= 198.1, p=0.021). Therefore, established regression model is significant regarding statistics. Also regarding R^2 value, predictive variables totally predicts 12% of impact variance. Undiscovered value is equal to 88%. In the other word, 12% of personal cognition about transformational leadership style in organization and personal recognition about quality of work life is due to personal cognitions about procedural justice in organization and 88% is due to other factors. To study level and direction of personal cognition about transformational leadership in organization and quality of work life were calculated regarding procedural justice about the organization and Beta coefficients have been calculated as well, which the results of this study are illustrated in table.

As it is observed from table, concerning the Beta value, procedural justice has had significant influence on personal cognitions about transformational leadership style in organization and quality of work life. This variable has been 12 percent influential for personal cognition about transformational leadership, and 7 percent for personal cognition about quality of work life, which concerning significance levels of 0.002, 0.04 for tow mentioned variables respectively, this value has been significant. Therefore, rejecting null hypothesis it could be concluded that the procedural justice regulates relation between transformational leadership and personal cognitions about quality of work life.

CONCLUSION

This study examine relation between transformational leadership using Bass and Olivio's scheme, inspired from Jellit et.al research model (2013), and quality of work life using Walton scheme, emphasizing on mediatory role of organizational justice variable, in the form of the ternary dimensions of Nihof organizational justice (distributional, procedural, and interactive justice) based on proposed following hypothesis in the statistical sample of total society health organization of Boroujerd city, which 105 cases have been selected from this 114 cases population using Kokran formulation:

Global hypothesis: There is relation between transformational leadership and quality of work life of the stuff.

Partial hypothesis

Distributional justice regulates relation between transformational leadership and stuff cognition about quality of work life.
Interactive justice regulates relation between transformational leadership and stuff cognition about quality of work life.
Procedural justice regulates relation between transformational leadership and stuff cognition about quality of work life.

Summarizing the results, researcher tries to provide the possibility of defining the meaning and interpretation of proposed hypothesis in the previous chapter, regarding rejection of null hypothesis and confirmation of total hypothesis of the study. Then we provide some suggestions toward obtained results and determine part of the limitations in study.

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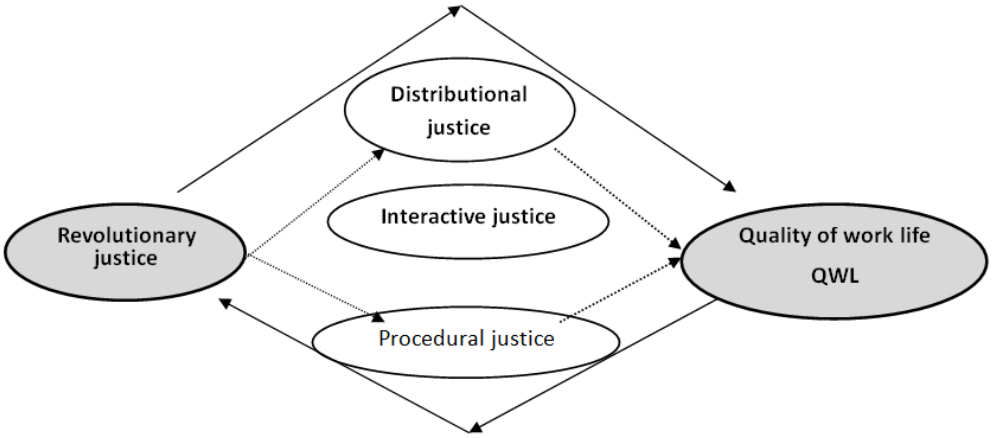

Figure 1. The operational research model

Table1: Pierson test to analyze main hypothesis of the study

Variable	Mean and standard deviation	Correlation	Level of significance
Transformational leadership	3/15 ± 0/64		
Quality of work life	2/58 ± 0/63	0/63	0/005

Table2: Multi variable regression analyzing to study first partial hypothesis

Variance resource	Sum of squares	Freedom degree	Squares average	F	Significance level	R	R^2
Regression	52/3	2	26/15				
Rest	8/9	103	0/08				
Total	63/3		----	523.3	0.005	0.69	0.48

Table3: Beta coefficients to study first partial hypothesis

Predictive variable	B	Standard deviation	Beta	T	Significance level
Constant value	0/45	0/09	-----	4/9	0/001
Transformational leadership	0/93	0/14	1/03	17/4	0/000
Quality of work life	-0/1	0/09	-0/12	-2/001	0/003

Table4: multi variable regression to study second partial hypothesis

Variance resource	Sum of squares	Freedom degree	Squares average	F	Significance level	R	R^2
Regression	107/4	2	53/7				
Rest	18/7	103	0/18				
Total	126/1	105	----	326.1	0.001	0.67	0.45

Table5: Beta coefficients to study second partial hypothesis

Predictive variable	B	Standard deviation	Beta	T	Significance level
Constant value	-0/68	0/13	-----	-5/4	0/001
Transformational leadership	0/99	0/08	0/76	13/1	0/001
Quality of work life	0/24	0/07	0/19	3/3	0/001

Table6: Multi variable regression analysis to study third partial hypothesis

Variance resource	Sum of squares	Freedom degree	Squares average	F	Significance level	R	R^2
Regression	0/86	2	0/43				
Rest	24/09	103	0/23				
Total	29/95	105	----	198.1	0.021	0.34	0.12

Table7: Beta coefficients to study third partial hypothesis

Predictive variable	B	Standard deviation	Beta	T	Significance level
Constant value	1/3	0/17	-----	7/9	0/0001
Transformational leadership	0/18	0/12	0/28	1/8	0/002
Quality of work life	0/19	0/07	-0/32	-2/02	0/048

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RESEARCH ARTICLE

Behavior Factor of Coupled Concrete Shear Walls Retrofitted by FRP

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ABSTRACT

Concrete shear wall is one of the key members to resist lateral loads in high structures. In many cases, it is inevitable to consider openings in shear walls due to the architectural limitations and facilities. This study usedpushover non-linear static analysis by finite element software, ANSYS,to evaluate the effect of composite FRPson ultimate capacity and behavior factor of the shear wall under lateral load. To validate the numerical model, the results of experimental shear walls were compared to the results of numerical analysis. The results of numerical modelsretrofitted by composite FRPrepresent an increase in ultimate bearing capacity of shear wall under lateral load, as well as decrease in displacement and increase in its behavior factor. For coupled shear wallretrofitted by FRP, the behavior factor was 8.26 under triangular loading.

Key words: shear wall, behavior factor, FRP, ANSYS, opening

INTRODUCTION

In order to provide stability and eliminate the earthquake damages, shear walls are used in tall, average and even short buildings. In comparison to shear frames, shear walls are more economical as the best way to control the lateral deflection of buildings. Shear walls are able to tolerate the highest portion of shear force in the baseline.Shear walls are also able to tolerate gravity loads of the building even after cracking. Shear walls with openings have good ductile behavior and high energy dissipation, if retrofitted properly. Shear walls are actually composed of two or more walls which are connected by coupled beams. Failures observed in these structures include the failure resulting from failed shear walls and the failure due to the failedcoupled beams. There are numerous methods for retrofittingshear walls, such as FRPs used asa strategy for seismic reinforcement. The main properties of FRP are

corrosion resistance, tensile strength, insulation, adhesion to concrete and thermal expansion. The main disadvantage of concrete is its weakness against tensile loads. Tensile strength of concrete is very low (about one-tenth of its compressive strength); this causes cracks in the concrete in points where the tensile stress is high and there is a displacement.

LITERATURE REVIEW

In 2000, Sugiyama reinforced eight walls on a scale of 1:3,of whichsix walls had openings in the form of doors and windows, and two others had openings in the form of door. Given the fact that the walls were retrofitted by FRPs,the results showed that the behavior of the entire complex did not change as a moment frame; instead, FRPs only improved the internal angle of the doors and improved crack widthsunder lateral load(Sugiyama et al,2000). Hiotakis et al (2003) evaluated the effect of concrete walls retrofitted by FRPs(Hiotakis et al, 2003). In their article, Li et al (2005)presented a three-dimensional nonlinear finite element modelof a shear wall using ABAQUS software. The most important parameter used in their studywasdamage plasticity to model the behavior of concrete. In addition, they used spring elements to model FRP elements. FRP improved the stress-strain curve (Li et al, 2005). Miao et al (2006) presented a nonlinear finite element model of a concrete shear wall analyzed by finite element of the multi-layer shell (Miao et al., 2006).

Analysis of Models

Different methods are used for design and evaluation of structures; here, numerical methods were used toanalyze shear walls (Introduction to Numerical Analysis,1987). Analyses performed by numerical methods present qualitative and quantitative results. Several methods are used to solve numerical problems, including finite element method, boundary element method, discrete element method, finite difference method. In analyses, a suitable element is selected to calculate the stiffness matrix of that element; then, the matrices are combined to form the total stiffness matrix. Finally, the boundary conditions are set for further processing.

Modeling and Validation

To validate the model,the wall modelled byKheyroddinand Naderpour(2008)which was retrofitted verticallyby FRP was modelled in ANSYS. As shown in Figure 1, the wall was 6.1m in height,1.9m in length and 10cm in thickness. The three-dimensional element, solid 65,was used for modelling concrete; this element can be used to model retrofitted and unretrofittedconcrete walls. This element containseight nodes with three degrees of freedom for each node, which is able to define the bar in three direction. In this study, Kheyroddin et al. (2008) evaluated the numerical and experimental modeling of a concrete shear wallretrofitted by FRP. The FRP- retrofitted wallis shown in the figure below. Obviously, the wings were retrofitted by FRP.

By loading applied to the upper wall in the form of force, the anchor reaction forces were obtained by thesoftware; theload-displacement curvewas plotted by ANSYS software for the modelled wall. Figure 3 compares the curve to Kheyroddinet al.

The comparison showed insignificant difference between the results of ANSYS and the results of Kheyroddin. This indicates the validity of ANSYS software for modeling the wall and valid results to analyze the structure by ANSYS. Obviously, these diagrams show the acceptable consistency of the results.

The Studied Models

A 12-storey building with 30 openings was modelled by the software to obtainthe actual sizes of the wall. The wall was 35cm in thickness. The goal was simply to obtain the approximate sizes of a standard wall with correct arrangements of the bars.

The bars used in the wall were 12mm in diameter. The bars were placed in 15cm from each other within the 2 ends of the wall (1m) and 30cm in the middle of the wall. The wall was separately modelled by ANSYS and exposed to incremental lateral loading until the wall failed. The three-dimensional element, solid 65, was used to model the concrete; this element can be used to model retrofitted and un retrofitted concrete walls. This element has eight nodes with three degrees of freedom for each node. For modelling, the used elements included link180 forbars and three-dimensional shell181 for FRP, which is useful for non-linear analyses, as well as long-lasting plastic deformations. Shell181 contains four nodes and six degrees of freedom at each node. The wall of the modelled 12-story building was modelled by ANSYS. The wall was exposed to pushover loading in which a point was set on top of the wall; the force gradually increased to a level where the wall lost its bearing and failed. The wall was 35cm in thickness. The stress was higher at the two ends of the wall; therefore, the mesh was smaller in these parts. For loading, 22 tons of concentrated load was applied to all 60 nodes of the upper wall. For boundary conditions, the wall was assumed to be connected to the foundation by a fixed joint.

Models 1, 2 and 3

This section discussesthe studied models and reinforcement of the walls without opening. These models includethe Model 1 (unretrofitted shear wall; Figure 5); the Model 2 (shear wallretrofitted in critical areas; Figure 6); the Model 3 (totally retrofitted shear wall; Figure 7).

After loading, the displacement contour of the Model 1 was given horizontally. Clearly,the greatest displacement (27cm) occurred on top of the wall. In the Model 2,a part along the two ends of the wall (60cm) was retrofitted by FRP. In theModel 3, the wall wastotally retrofitted by FRP. Because of displacement, the fixed end of the wall was the focus of stress due to the constrained degrees of freedom. This is clearly shown by the stress contour of the lower wall in Figure 7 for the unretrofitted model and the stresscontour ofthe modeled FRP- retrofitted concrete wall in Figure 8. Clearly, stress was higher on the lower wall than the rest of the wall. Moreover, the stress grew as the load applied to the wall increased.Strain contour and cracks are shown in the figure below.

Strain was higher at the lower wall and parts under strain than other areas where cracking began from compressive and tensile corners. Obviously, damages occurred in these areas due to the weak performance of the concrete against strain. These damages were maximal at the tensile corners. The damages were more severe in the FRP- retrofitted model compared to the FRP- retrofitted model under equal loading. After loading and analysis, the output related to the anchor reaction force was obtained by the software.

The unretrofitted walllost its efficiency under an 89-ton force, while the retrofitted wall tolerated93-95 tons at most. Initially, the stiffness of both walls was noticeable; in the early stages of loading,both walls could tolerate the load. However, the onset of cracking changed the structural stiffness, and the slope of the curve suddenly reduced. Moreover, the anchor reaction force decreased, indicating the reduced bearing capacity of the structure.The greatest reaction force generated in retrofitted models (Models 2 and 3) was 93 and 95 tons. As shown in the diagram, the ultimate bearing capacity of the Model 1 was 89 tons; that means FRP increased bearing capacity by7% in the member as a whole and 4.5%in a part of the member.

In addition, the diagrams reflect the fact that the displacement caused in Model 3 is far less than the Model 2 and in Model 2 than the Model 1 under equal amount of load.At the best scenario, FRP decreased displacement by 12% and 17%.

Behavior Factor

In the Model 1, the target displacement was$\delta_t = 27\ cm$ in which the overall performance of the structure, as well as the critical period of the coupled beams were at the life safety (LS) level. This study usedYangmethod to calculate the behavior factor. The pushover curvesare presented as follows.

The behavior factor was 9.6 for the Model 2 (local reinforcement) and 10.19 for the Model 3 (overall retrofitted). For the Model 1 (unretrofitted),the behavior factor was 9.07, indicating an increased behavior factor caused by coating the wall. Next, the wall with opening was modeled by ANSYS software. The wall was exposed to pushover loading in which a point was set on top of the wall; the force gradually increased to a level where the wall lost its bearing and failed.

Models 4, 5 and 6

Now, this section describes the studied models and retrofitted walls with opening. These models include theModel 4 (unretrofittedshear walls; Figure 16); the Model 5 (shear wallretrofitted in critical areas; Figure 17); theModel 6 (totally retrofitted shear wall; Figure 18).

After loading, the displacement contour of the Model 4 was given horizontally;obviously, the greatest displacement was26cm.

Because of displacement, the fixed end of the wall was the focus of stress due to the constrained degrees of freedom. The stress contour of the lower wall shown in Figure 29 was givenfor the unretrofitted model.

Obviously, thestresswas higher at the lower wall than the rest of the wall;moreover, the stress grewas the load increasedon the wall. Figure 30 shows the stress contour at the beginning and end of the loading for the Model 4, 5 and 6. For retrofitting, two cases were investigated; first, 60cm of the two ends of the wallas well as windows wereretrofitted. Second, the entire wall was retrofitted by FRP.

At the beginning of the loading, the stress contourwas higher at the two ends of the wall than other areas. As the load increased, the stress was higher at the lower wall,particularly on the part which wasunder tension. Strain contour and cracksareshown in the figure below.

Stress was maximal around the opening where materials definitely started tocrack. Plastic strain energy generated in the models suggests that the areas around the opening had maximum plastic strain energy due to the lateral loading. The plastic strain energy suggests that these areas are more at risk of damage. Obviously,damages were more severe in the unretrofittedmodel compared to FRP-retrofitted model. Once the loading finished, the output of the anchor reaction force was obtained by the software. Comparison of the FRP-retrofitted wall to the entire surface is not available in the form of contour. Comparison of diagrams shows higher increase in bearing capacity ofthe wall coated by FRP than the case without FRP.

The unretrofitted wall lost its efficiency under a63-ton force, while the retrofitted wall tolerated73-76 tons at most. Initially, the stiffness of the three walls was noticeable; in the early stages of loading, three walls could tolerate the

load. However, the onset of cracking changed the structural stiffness, and the slope of the curve suddenly reduced. Moreover, the anchor reaction force decreased, indicating the reduced bearing capacity of the structure. The greatest reaction force generated in the retrofitted models (Models 5 and 6) was 73 and 76 tons. As shown in the figure, the ultimate bearing capacity of the Model 4 (unretrofitted) was 63 tons; that means FRP increased bearing capacity by 16% and 21%. In addition, the diagrams reflect the fact that the displacement caused in Model 6 is far less than the Model 4 and 5 under equal amount of load. At the best scenario, FRP decreased displacement by 10% and 16%.

Then, a 12-storey building wastaken in consideration. The results show that the unretrofitted wall lost its elasticity in 26-ton baseline shear and 9cm displacementand became plastic. In 63-ton baseline shear and 26cm displacement,the baseline compressive reinforcements started to flew and failureoccurred. From this point onwards, the increased resistance stopped and the failure of compressive concrete and flow of the compressive reinforcements increased until the wall demolished. Coupled beams did not fail; instead, high tensile stress on the foundation and the roof of the first floor caused damages to the wall.

The locallyretrofitted wall lost its elasticity in 28.8-ton baseline shear and 8cm displacement and became plastic. In 72-ton baseline shear and 24.5cm displacement, the baseline compressive reinforcements started to flew and failure occurred. From this point onwards, the increased resistance stopped and the failure of compressive concrete and flow of the compressive reinforcements increased until the wall demolished. Coupled beams did not fail; instead, high tensile stress on the foundation and the roof of the first floor caused damages to the wall.

The totallyretrofitted wall lost its elasticity in 28.8-ton baseline shear and 7cm displacement and became plastic. In 76.5-ton baseline shear and 22.5cm displacement, the baseline compressive reinforcements started to flew and failure occurred. From this point onwards, the increased resistance stopped and the failure of compressive concrete and flow of the compressive reinforcements increased until the wall demolished. Coupled beams did not fail; instead, high tensile stress on the foundation and the roof of the first floor caused damages to the wall.

Behavior Factor

In model 4, the target displacement was$\Delta_t = 26$ cm in which the overall performance of the structure as well as critical period of the coupled beams were at LS level. The pushover curve of the models is represented below.

The behavior factor was 7.08 and 7.58 for the Model 5 and 6, respectively. The behavior factor was 6.72 for the Model 4, suggesting the increase in behavior factor by coating the wall.

Comparison of the Reinforced Wall with and without Opening

The comparison ofthe wallswith and without opening showed that the baseline shear and displacement were higher in the latter than in the former. In the wall with opening, the baseline shear decreased by 25% and displacement dropped by 10%.

By comparing the two controls,the behavior factor reduced by 35%,explaining the drastic reduction in the behavior factor of the shear wall with opening compared to the wall without opening.

CONCLUSION

Numerical studies were conducted on two high-rise shear walls with and withoutopeningto evaluate the effect of square openings on ultimate bearing capacity of the walls and weaknesses caused by openings. Eventually, shear

walls were retrofitted by FRP. Obviously, FRP increased behavior factor and ultimate capacity of shear walls. By comparing the behavior factor of the wallswith and without opening,the behavior factor reduced by 35% on average; this implies a drastic reduction in behavior factor of shear wall with opening compared to the wall without opening. In addition, stress was higher in the lower wall than the rest of the wall. Openings in the shear wall cause a deficit in the course of force transmission to the anchor and considerably influence the capacity of the shear wall with opening.

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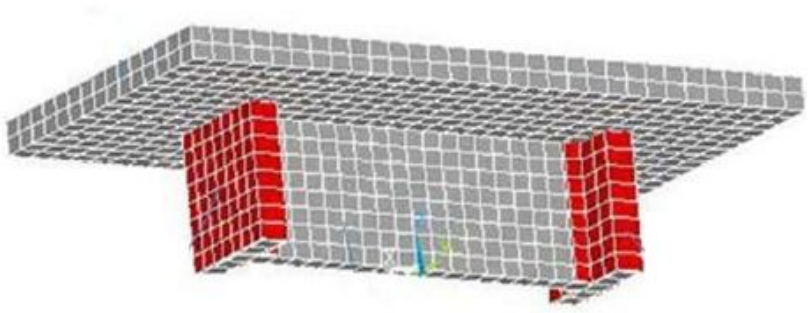


Figure 1: The FRP-reinforced wall of Kheyroddin

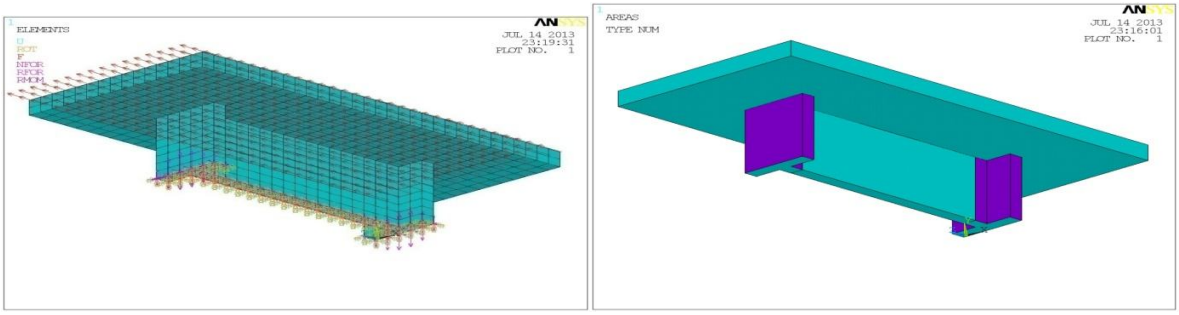


Figure 2: Elements used formodelling, meshingand loading the wall

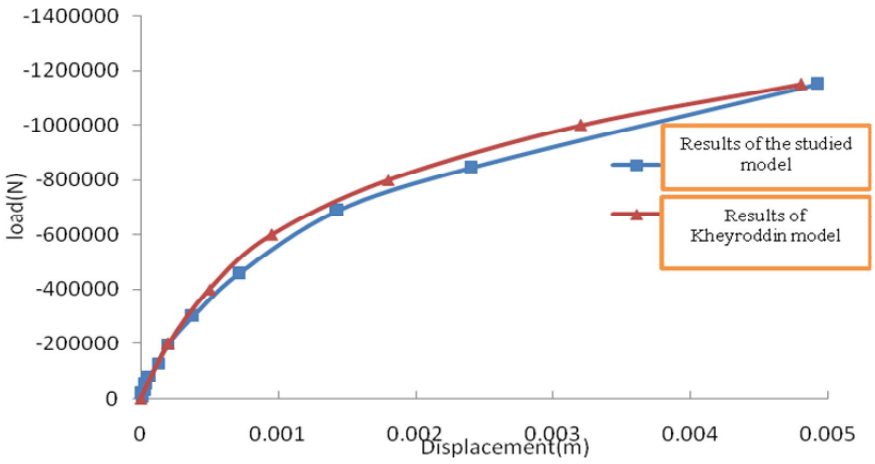


Figure 3: A comparison between outputs of Kheyroddin and the software model

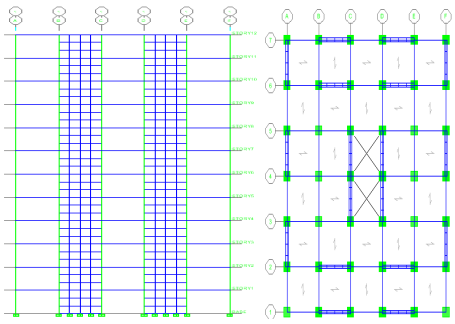


Figure 4: The model in ETABS

Figure 5: Model 1 (unretrofitted shear wall)

Figure 6: Model 2 (wall retrofitted in critical areas)

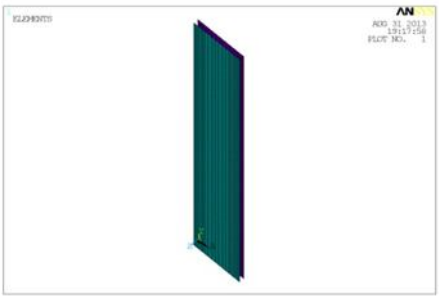


Figure 7: Model 3 (totally retrofitted shear wall)

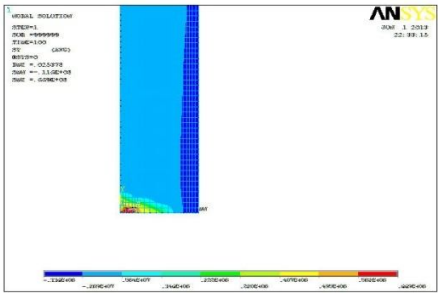


Figure 5: Stress contour of the unretrofittedlower wall

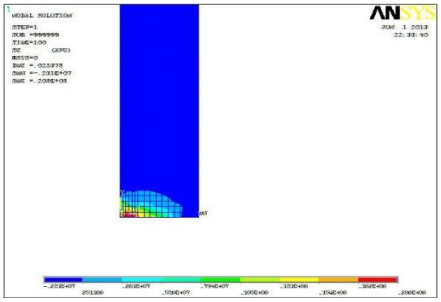
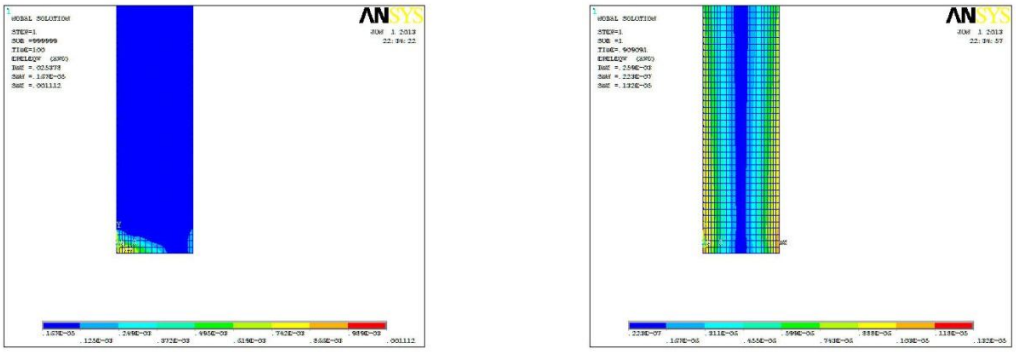


Figure 6: stress cantor ofthe retrofitted lower wall



A) at the end of loading **B) at the beginning of loading**

Figure 7: strain contourand cracks in the wall

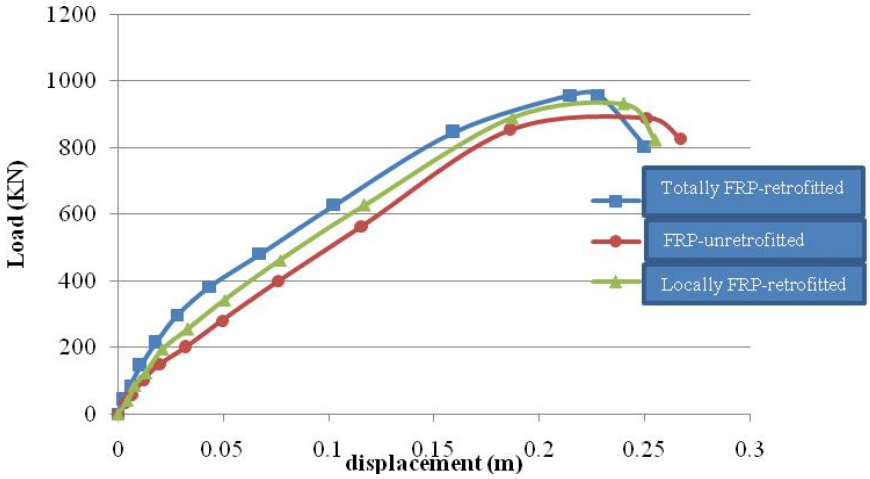


Figure 8: Load-displacement curve for the models 1, 2, 3

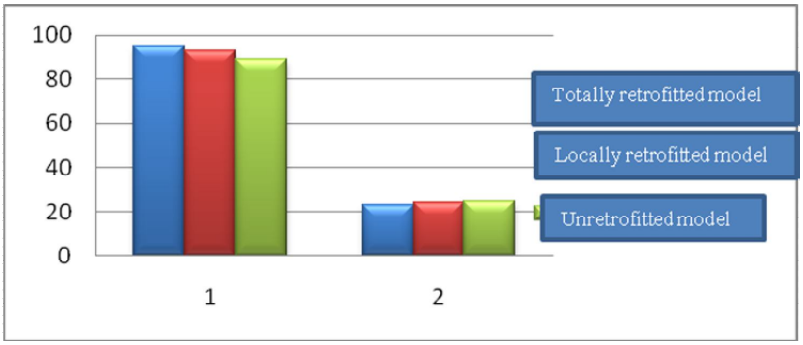


Figure 9: Comparison of bearing capacity and ultimate displacement of the models 1, 2, 3

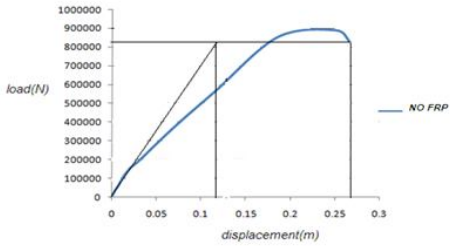


Figure 13: pushover curve of the Model 1

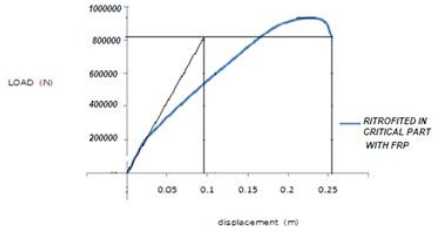


Figure 14: pushover curve of the Model 2

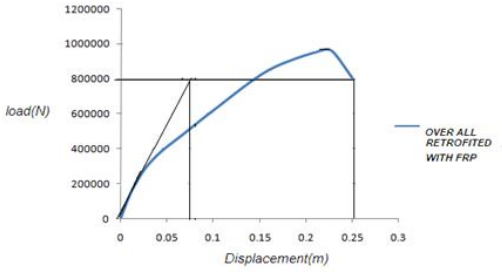


Figure 15: pushover curve of the Model 3

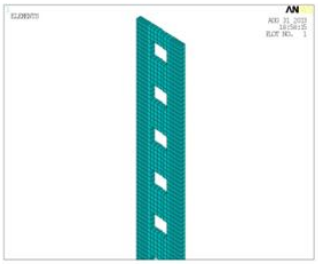


Figure 16: model 4 (unretrofittedshear wall)

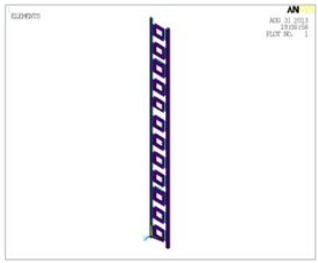


Figure 17: Model 5 (shear wallretrofitted in critical areas)

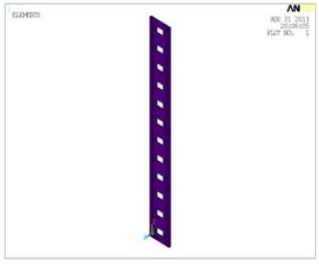


Figure 18: model 6 (totally retrofitted shear wall)

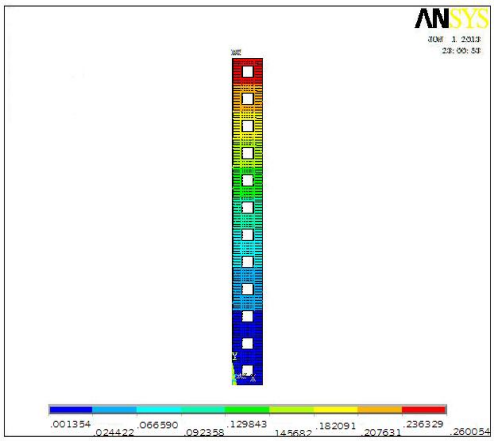


Figure 10: horizontal displacement of the Model 4

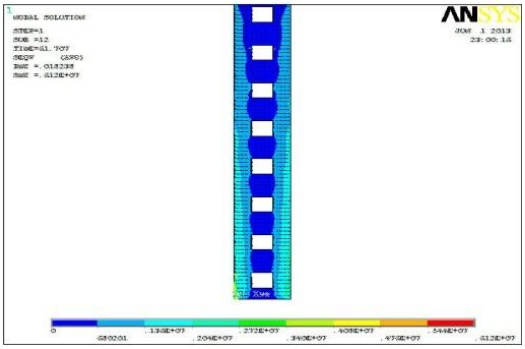
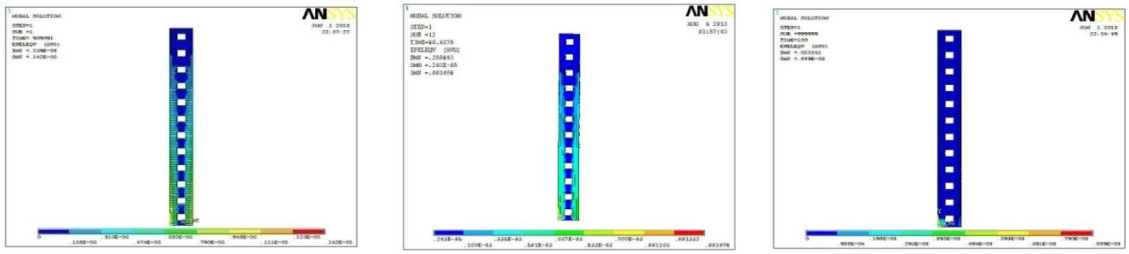


Figure 11: stress contour of the lower wall in the unretrofitted model



C) Model 4 B) Model 5 A) Model 6

Figure 19: strain contour and cracks in the wall

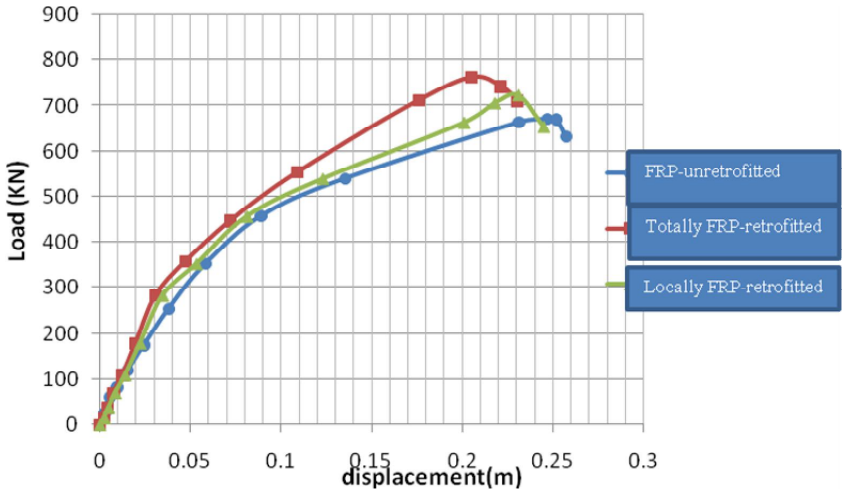


Figure 12: load-displacement curve for Model 4, 5 and 6

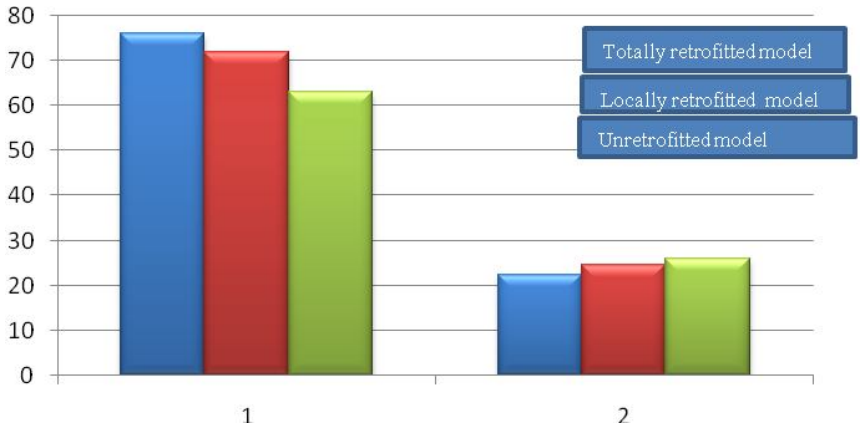


Figure 13: comparison of bearing capacity and ultimate displacement of the models, 4, 5 and 6

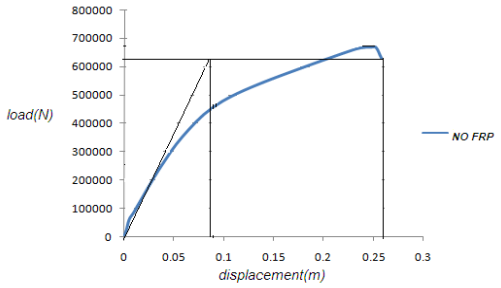


Figure 14: pushover curve of the model 4

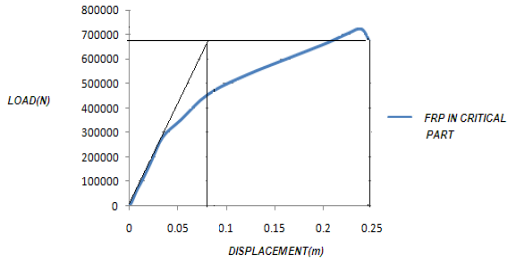


Figure 15: pushover curve of the model 5

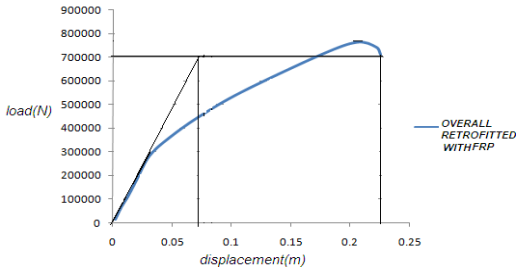


Figure 16: pushover curve of the model 6

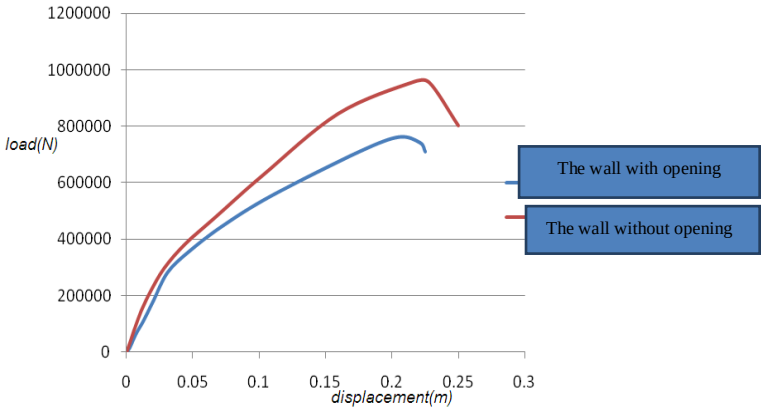


Figure 17: comparison of the pushover curve for the wall with and without opening

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RESEARCH ARTICLE

Comparison of Behavior Factors in Walls Retrofittedby FRP with and without Opening under Triangle Load Distribution

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ABSTRACT

This study used non-linear static pushover analysis by finite element software (ANSYS)to evaluate the effect of composite FRPson ultimate coefficient and behavior factor ofa shear wall with opening under lateral load. The results obtained from numerical modelsretrofittedbycomposite FRPsrepresent an increase in ultimate bearing capacity of shear wall under lateral load as well as a reduction indisplacement and increase in behavior factor. A comparison of the walls with and without opening showed a reduced behavior factor, suggesting a severe reduction in behavior factor of shear wall with opening compared to the wall without opening. For a coupled FRP shear wall, the obtained behavior factor was 8.26under a triangular loading.

Key words: the wall with opening, the wall without opening, FRP

INTRODUCTION

Iran is located in an actively seismic region of the world. The tall buildings tolerate a A portion of the lateral loads by shear walls. Position of shear walls as well as architectural needs sometimes requires regular openings in the height of the shear wall. Coupled shear walls are walls with two-sideopenings connectedby joint beams. Connective beams increase lateral stiffness and reducestress in the wall. The shear walls with opening show proper ductile behavior and high energy dissipation, if they are well retrofitted; therefore, it is recommended to use these walls in buildings. In fact, the most important weakness of shear walls with openings is their coupled beams. These beams are deep and short in length;deep beams occur in small thicknesses and show improper behavior. There are several ways to retrofitte shear walls; one way is to useretrofitting metal strips and coat by shotcrete.FRPs are used for seismic

reinforcement which can replace traditional methods for their satisfactory properties such as high resistance and low weight, protection against corruption and corrosion, and fast and easy installation.

LITERATURE REVIEW

In 2000, Sugiyama studied eight retrofittedwalls on a scale of 1:3,of which sixhad openings in form of windows and doors and two others had only one opening. Three unretrofitted walls were tested as control samples and the rest five samples were retrofittedprior to loading by different placements of panels in different thicknesses. Although the axial loading capacity of FRP walls increased, the behavior of the shear frame did not change as a whole; thus, FRPs only improved the change in internal angle of doors and improved the width of the cracks under lateral load (Sugiyama et al., 2000). Nagy (2005)studied theretrofittedshear walls with openings. In this study, five 1:4 models were cyclically loaded prior to reinforcement by FRPs. The FRPs were attached on one side of the wall and braced to the foundation by corner stone. In this experiment, the elastic limit and ultimate load increased by47% and 45%, respectively (Nagy-Gyorgy et al., 2007).Kheyroddinet al (2008) examined the seismic behavior of shear walls retrofittedby polymeric fibers. Considering the faults existing in available codes for analysis of FRP-retrofittedshear walls, they suggested new codes (Kheyroddin et al. (2008).

Numerical Methods and Finite Element Analysis

Different methods are used for design and evaluation of structures;this study used numerical methods. Analyses performed by numerical methods present their results in two forms: qualitative and quantitative. Mainly, a number of methods are used to solve numerical problems, including finite element method, boundary element method, discrete element method and finite difference method (Introduction to Numerical Analysis, 1987). For more detailed analysis,a softwareis used. This study used the ANSYS software to compare the FRP-retrofittedwalls with and without opening.

Properties of the ModelledElements to Examine theBehavior of RetrofittedConcrete Iointsin ANSYS

The numerical ANSYS software isa finite element software. ANSYS allows the analysis of different types of structures, such as frames, tanks, dams, bridges etc. and structural components, such as steel joints, steel or concrete members, isolators, etc. in different waysincluding static analyses, load reciprocating, modal, time history, spectrum and so on.

The Models

A 12-story building with 30 openings was modelled to obtain the real sizes of the wall in the software. The wall was 35cm in thickness. The goal is simply to obtain an approximate sizeby correct arrangement of bars in a standard wall.

The bars used in this wall were 12mm in diameter.The bars were placed in 15cm from each other within the 2 ends of the wall (1m) and 30cm in the middle of the wall. The wall was separately modeled by ANSYS and exposed to incrementallateral loadinguntil the wall failed. The three-dimensional element, solid 65,was used to model the concrete; this element can be used to model retrofittedand unretrofittedconcrete walls. This element has eight nodes with three degrees of freedom for each node, which is able to define the bar in three direction. The wall of the modelled 12-story building (35cm in thickness) was modelled by ANSYS. The wall was exposed to pushover loading in which a point was set on top of the wall; the force gradually increased to a level where the walllost its bearing and failed. The wall was 35cm in thickness. Thestresswas higher at the two ends of the wall; therefore,the mesh was smaller in these parts.For loading, the triangular lateral force was distributed in accordance with the Code 2800,

assuming that all stories were equal in mass. For boundary conditions, the wall was assumed to be connected to the foundation by a fixed joint.Table 1 presents the coefficients of triangular lateral load distribution instories.

Now, this section describes the studied models and reinforced walls without opening, including the Model 1 (unretrofitted shear wall), the Model 2 (shear wallretrofittedin critical areas), and theModel 3 (totally retrofittedshear wall).All models were exposed toa triangular load distribution. The pushover diagrams were plotted for three models. Clearly, the damages were more severe in the model without FRP compared to the FRP model under equal force. After loading and analysis, the output related to theanchor reaction force was obtained by the software.

Diagrams suggest that FRP increased the bearing capacity by 13% and 22% for equal loading. Behavior factor of the walls without opening was calculated and the pushover curve wasplotted for all three models.

Behavior factor was 9.43 forthe Model 2 (local FRP) and 9.92 for the Model 3 (overall FRP). The behavior factor was 8.4 for the Model 1 (no FRP), suggestingthat the behavior factor increased by coating the wall.

This section describes the studied models and retrofittedwalls with opening, including the Model 4 (unretrofitted shear wall), the Model 5 (shear wallretrofittedin critical areas), and the Model 6 (totally retrofittedshear wall). All models were exposed to the triangular load distribution. The pushover diagrams were plotted for three models. As shown in Figure 8, damages were more severe in the FRP-unretrofitted model compared to the FRP-retrofittedmodel under equal loading. After loading, the output related to the anchor reaction force was obtained by the software.

Diagrams suggest that FRP increased the bearing capacity by 8% and 16% for equal loading. Behavior factor of the walls with opening was calculated and the pushover curve was plotted for all three models.

Behavior factor was 7.8 for the Model 5 and 8.26 for the Model 6. The behavior factor was 5.7 for the Model 4, suggesting that the behavior factor increased by coating the wall.

CONCLUSION

Numerical studies were conducted on two tall shear walls with and without opening to evaluate the effect of square openings on ultimate loading capacity of walls and the faults caused by these openings. Then, the shear walls were retrofittedby FRP. This study used triangular lateral force distribution. The results showed that the ultimate loading capacity increased by 13% and 22% in the Model 2 and 3, respectively; while the ultimate loading capacity increased by 8% and 16% in the models with opening (5 and 6, respectively). Behavior factor also increased by 12.26%, 18.1%, 36.8% and 44.9% in the models 2, 3, 5 and 6, respectively. The behavior factor also reduced by 30% due to the severe reduction in behavior factor of the shear wall with opening compared to the wall without opening.

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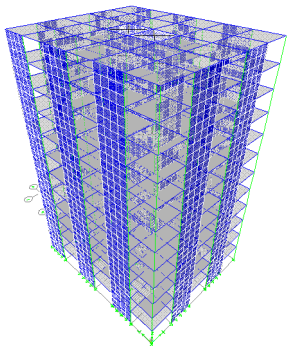

Figure 18: The modelled building in ETABS

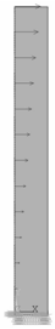

Figure 19: Triangular lateral force distribution

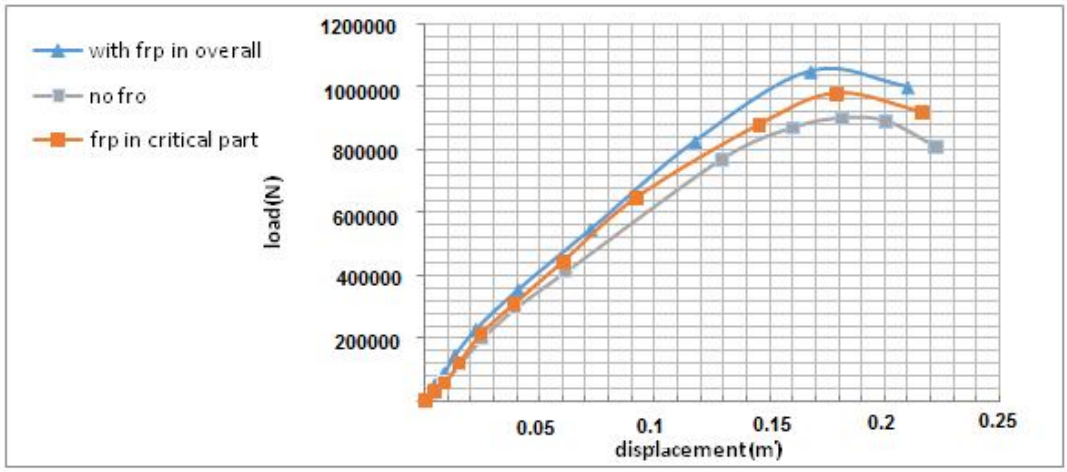

Figure 20: Comparative diagram (load-displacement) of walls with and without FRP

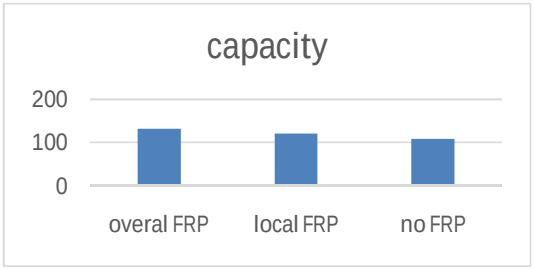

Figure 21: Capacities of walls in three models

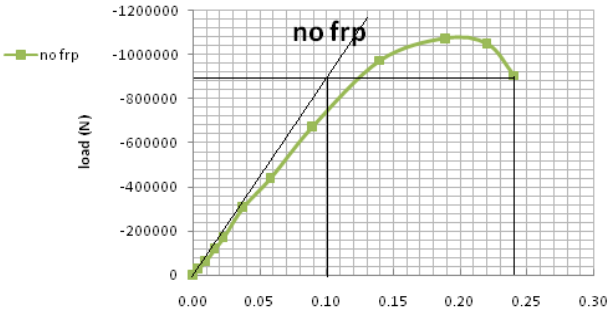

Figure 22: Pushover curve of the model 1

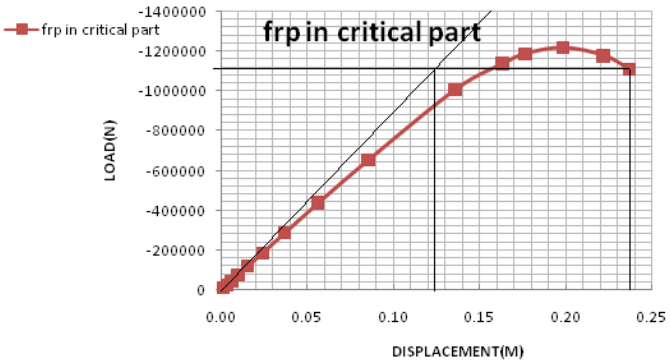

Figure 23: Pushover curve of the model 2

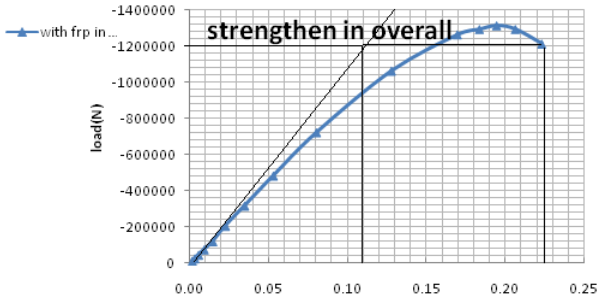

Figure 24: Pushover curve of the model 3

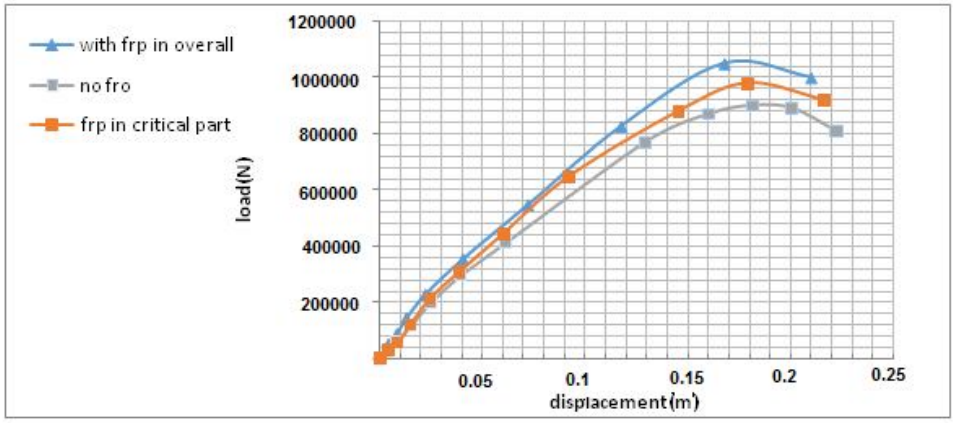

Figure 25: Comparative diagram (load-displacement) of walls with and without FRP

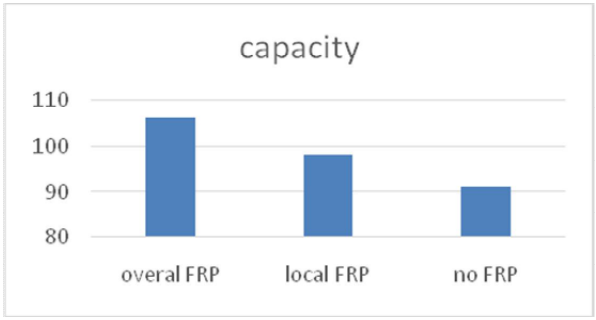

Figure 26: Capacities of walls for three models

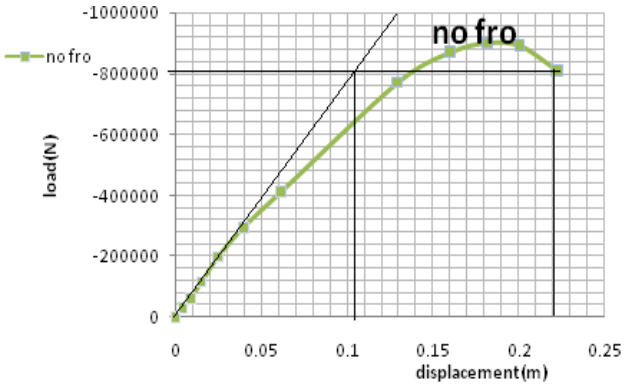

Figure 27: Pushover curve of the Model 4

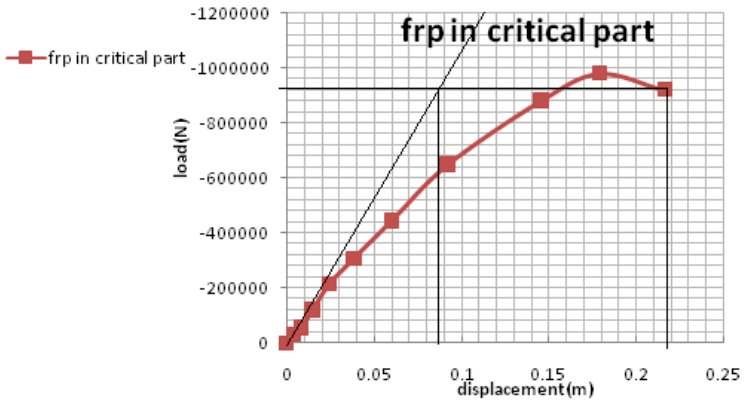

Figure 28: Pushover curve of the Model 5

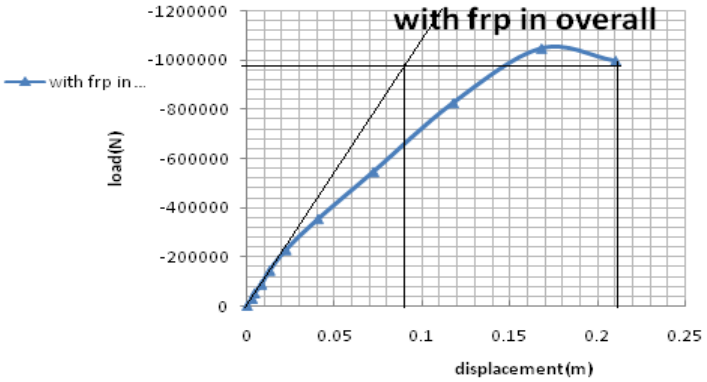

Figure 29: Pushover curve of the Model 6

Table 1: Coefficients of the triangular lateral load distribution

Story	1	2	3	4	5	6	7	8	9	10	11	12
Distribution	0.0128	0.0256	0.0384	0.0513	0.0641	0.0769	0.0897	0.102	0.115	0.128	0.141	0.154