AENSI Journals

Advances in Environmental Biology

ISSN-1995-0756 EISSN-1998-1066

Journal home page: http://www.aensiweb.com/AEB/

Iranian Tailor-Made Computer Software Development Problem Factors

[1]Sedigheh Mohamadesmaeil and [2]Nader Saboktakin

[1]Department of Knowledge and Information Science, Islamic Azad University, Science & ResearchBranch, Tehran, Iran
[2]PhD Candidate in Knowledge and Information Science & Faculty Member of Persian Gulf University, Bushehr, Iran

ARTICLE INFO

Article history:
Received 13 September 2014
Received in revised form 26 November 2014
Accepted 25 December 2014
Available online 15 January 2015

Keywords:
Iran, tailor made, Development, Computer Software, challenge, SEM

ABSTRACT

Present research intends to study challenges of computer software development in Iran. According to Standish Group's Chaos Report, only few software are completed successfully while a considerable part of them are failed or faced with challenges. Taking time and costs more than initial estimation and quality less than initial expectations are regarded as challenges. Studying resources, some of the most challenging factors in software development phases which mentioned in scientific texts have been extracted and 201 questionnaires out of 234 questionnaires have been returned by managers of companies' project team i.e. nearly 8 %. Research variables had acceptable Cronbach's alpha, oscillating in range of 741% to 823%. At first in order to analyze gathered data, demographical characteristics of the sample people in descriptive level have been studied including members of project team, projects duration, average experience of project team and the methodology. Confirmatory factor analysis was used in analytical statistics of this research in order to examine significance between observer variable and latent variable and also fitting the measurement models and finally, structural equation modeling has been used by LISREL to study causal relations of variables and conceptual model test of research. Findings show that the most important challenges of computer software development which have influence upon challenges concerning maintenance phase are related to documentation and programming quality and also personnel resources phases

To Cite This Article: Sedigheh Mohamadesmaeil and Nader Saboktakin, Iranian Tailor-Made Computer Software Development Problem Factors. ***Adv. Environ. Biol., 8(25),*** *352-363, 2014*

INTRODUCTION

Computer software development (or deployment) principally is more risky compared with other industrial products. According to results by Standish group's chaos report that is well known to Software Crisis, 3 5 IT sections managers in 1994 have participated in study and they reported that only 1 % of software development projects have been completed successfully, 53% have been faced with challenges and 31% have been failed [7]. A similar study in 2000 concerning the field shows that only 28% of software development projects have been completed successfully, 23% have been stopped and 49% have been faced with serious problems [12]. Only 29% of software development projects have been completed successfully in 2004 while 53% & 18% has been challenged and failed respectively. Similarly, only 32% of software development projects have been completed successfully in 2009 and 44% & 24% has been challenged and failed respectively [3]. Project success depends on suitable timetable of project completion in software development projects and this completion should depend on exact estimation of prime cost and software quality in development process and applying specifications which have been determined and predicted at the beginning of the project. Here, challenge means that a completed project imposes more cost and time and lower quality rather than initial expectations due to lack of appropriate planning and policy in time, cost and quality management. The project is regarded as failed if it stops in any phase of software life cycle or if it remains uncompleted [8].

Principally, several factors should be considered in software development, which parts of them are related to software development phases and also other important factors such as human resources and process management that their absence can affect on computer software development. Considering the fact that attention to personnel is one important principle in project management of software development, due to companies' reliance on manpower's skill and specialty, human resources is considered as a main capital of an organization

Corresponding Author: Sedigheh Mohamadesmaeil, Department of Knowledge and Information Science, Islamic Azad University, Science & ResearchBranch, Tehran, Iran
E-mail: m.esmaeili@gmail.com

to achieve its goals. Software development process means a part which is related to all phases of software development and its goal is to manage software life cycle in order to supervise and evaluate better and finally, to decrease challenges and promote qualities. Methodology also consists of consecutive, successive methods and guidelines that are tools to formulate and regulate these processes. Hence, software developers use various methodologies such as Software Process Improvement (SPI), Agile and Rational Unified Process (RUP) models in software manufacturing phases. Although, each mythology uses special techniques and standards in software development; however they follow same principles and phases which observing them is avoidable. These principles begin with analysis, feasibility study and it leads to software manufacturing operation and finally maintenance after study on planning, manufacturing & implementation, program test. Some reasons of the challenges, failure or success of software projects are made because of comprehensive attitude to observe these phases; focusing components such as time, cost, quality and goal achievement. Meanwhile some of challenges are related to other infrastructure factors that affect on software development [4].

On the other hand, all efforts and activities in direction of software development and each phase is a mean to the end that the software will be able to remain for a long time after implementation and installation and to adopt changes, relative unavoidable, arisen from environmental conditions.

Lack of adaption with new conditions by the software makes it less usable and it will be out of date or retired after a while. One example is disk operating system (DOS) that is out of date at present time. More challenges in relation to software maintenance, makes less possibility of software survival. These results are consequences of challenges that have been made in previous phases of software development and have been transferred to maintenance phase. On the other hand, challenges concerning maintenance phase have feedbacks on other phases of software development and finally leads to decrease or remove affiliated challenges [9]. Software life cycle means considering the very subject. Thus, it seems that maintenance is one of the most important phases in software life cycle. Some researchers believe that there is a great importance for software maintenance phase in a way that they have divided software life cycle to two main phases of software development (deployment) and software maintenance. About % of whole the costs of software life cycle is allocated to maintenance phase [14].

Chen and Huang [1] studied software development problems and its influence on software maintenance phase. Problems or challenges of software development are allocated to the fields such as documentation quality, system requirements, programming, personnel resources and process management. Internal & external quality of software is other main request by users. Internal quality implies on considering type of production and includes items such as study on structure and its complexity. External quality implies on running system in its environment. ISO institute and International Electro technical Commission cited six points as features of external quality of software products: functionality, reliability, usability, efficiency, maintainability and portability; of which maintainability is more important than others. Results show that it is necessary to decrease challenges related to software development if the developers try to increase software maintainability. Also, lessening the challenges in relation to phases of documentation quality & programming quality lead to good maintainability. Results suggest that applying software process improvement (SPI) reduce the challenges related to documentation quality and process management and can enhance software maintainability. There is also a significant relation between software development phases and maintainability regarding results by Pearson coefficient test and this relation is negative with average intensity. It means more challenges in software development decreases maintainability while decreasing these challenges increase it.

Taher, Ahmad and Kazirun [13] studied challenges which companies encounter them to use standards and procedures in software development projects. As part of their research and for improving software quality, they regarded standard programming by companies. Results show that 77% of companies stated that they use coding standard for programming in projects and all software engineers who works in companies, have attained required educations to use coding standard. 19% of companies stated that they use sometimes coding standard. 4% of companies have not cared about coding standard and stated that they rarely use them in programming.

Kannabiran & Sankaran [6] studied on factors in external software quality such as requirement uncertainty, trained personnel, maturity process, communication and control, knowledge transfer and integration, technical infrastructure. Results show that requirement uncertainty is extremely related to all aspects as for software quality, while maturity process and trained personnel are related to software quality to some average extent, meanwhile communication and control, knowledge transfer and integration, and technical infrastructure are related to software development quality less than others. So in consideration of the above-mentioned points research hypotheses are established and then tested them with the help of structural equation modeling.

Research objectives and Questions:

The object of this research is to determine factors related to challenges of computer software development phases which influence upon challenging concerning maintenance phase. So the main questions of present research are:

1- What are demographical specifications of computer software development projects' team members?

Advances in Environmental Biology, 8(25) Special 2014, Pages: 352-363

2- Is there a significant relation between challenges of maintenance phase (as the most important and time and cost consuming phase) with other phases of computer software development challenges including documentation qualities (DOC), system requirements (SYS), programming quality (PGM), personnel resources (PER) and process management (PM)?
3- Which software development phases have the most significant influence on maintenance phase?

Research method:

Present research which belongs to applied type is an analytical-survey research. It means that computer software development challenges have been studied by analytical-survey method. The questionnaire is also used by five-level Likert scale as a tool to gather information. Items of this questionnaire have been extracted as a result of studying texts and resources related to this branch, particularly, a prepared questionnaire by Chen and Huang which had been published in 2009 in Journal of Systems and Software no.82. It should be noted that this journal belongs to Institute for Scientific Information (ISI) with Impact Factor of 1.28.

Thus, items of initial questionnaire have been produced and compiled in dimensions and 30 items based on the most challenging factors reported by software developers during 1981 to 2007 and official valid resources have published these challenges in scientific texts. It was formulated as final questionnaire considering opinions and final confirmation by associate professor, assistant professor and software experts, and pilot survey in a society consist of 30 members of working people in valid ICT companies, then the questionnaire was distributed in research society by targeted method.

In other words, Library & Information Science and software engineer masters' opinions have been used in order to obtain questionnaire validity and the questionnaire has been confirmed by experts of this field. So it can be considered as a researcher-made questionnaire. Also Cronbach's Alpha Coefficient was used for questionnaire reliability. According to alpha coefficient column in table-1; it is observed that research variables have acceptable alpha value.

Table 1: Cronbach's Alpha Coefficients for Research Variables.

Variables	Cronbach's Alpha
Challenges as for documentation quality	0.8 1
Challenges as for system requirement	0.811
Challenges as for programming quality	0.755
Challenges as for maintenance	0.823
Challenges as for personnel resources	0.741
Challenges as for process management	0.799

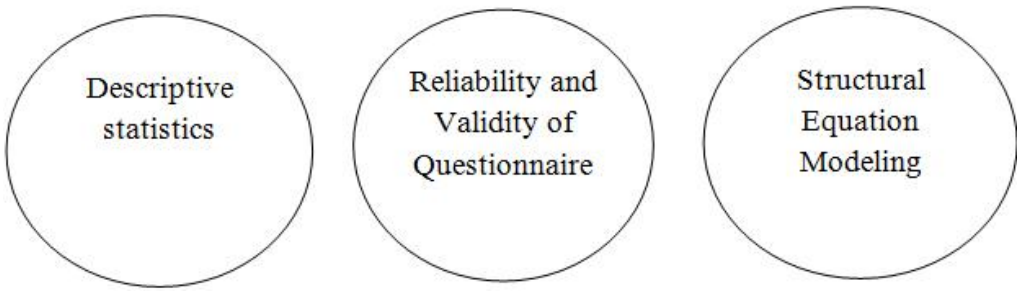

Fig. 1: Used Analysis in Present Research.

This research statistical society includes all tailor made computer software developers who have a valid technical confirmation certificate issued by Informatics Higher Council. Names of these companies have been extracted from website of Informatics Higher Council. First they were separated from other companies and 00 computer software developers were specified. According to Krejcie & Morgan Table of sample size of questionnaire; sample volume consists of 234 companies with ranks 1 to 7 for which questionnaires were sent. 201 questionnaires were filled and returned by project managers of software development team, therefore, about 8 % of questioners have been returned. It should be noted that, computer games developers which work under Computer Games National Institute, are not included in this research society. At first in order to analyze gathered data, demographical characteristics of the sample people in descriptive level have been studied including members of project team, projects duration, average experience of project team and the methodology. Confirmatory factor analysis was used in analytical statistics of this research in order to examine significance between observer variable and latent variable and also fitting the measurement models and finally, structural equation modeling or SEM has been used by LISREL method to study causal relations of variables and conceptual model test of research.

Research findings:

1- What are demographical specifications of project teams' members?

This part of statistical analysis studies on way of statistical sample distribution obtained from computer software development companies regarding variables such as number of members of projects' teams or groups, duration of projects completion, average experience of project teams' members and used methodology in projects.

Table 2 of frequency distribution shows status of number of members of teams. Among 201 participants, the highest frequency belongs to project teams with 3-5 members with 34.8% and about 70% project teams have 10 members or less. Meaning that most of projects are rather small or medium in comparison with projects which are developed by teams of more members.

In terms of duration of projects completion. Among all sample groups, the highest frequency belongs to groups which have completed the projects between to 12 months with 3 .3% and about 5 % of project completed less than 13 months. Meaning that more than half of projects have completed in short duration in comparison with projects which have completed in more duration.

Moreover, the highest frequency belongs to teams in which members are experienced 4- years with 54.2% and about 80% of teams' members have years of experience or less. An indication of the vast majority of projects have developed by younger developers.

And finally In terms of used methodology in software development. Only 4 project teams' members used SPI methodology (about 2%) and the highest frequency in used methodology in software development belongs to RUP methodology with 32.8% which alongside with the development of software, it is also embedded process management related to each phase of software development in advance. Also no methodology has been used by 23 project teams' members. An indication of about 12% of projects are relatively small ones which the developers' teams feel no need to use methodology.

2- Is there a significant relation between challenges of maintenance phase (as the most important and time and cost consuming phase) with other phases of computer software development challenges including documentation qualities (DOC), system requirements (SYS), programming quality (PGM), personnel resources (PER) and process management (PM)?

Confirmatory factor analysis of research variables:

Results of confirmatory factor analysis have been obtained by LISREL software for each variable of research separately. It should be noted that, factor loading should be more than 0.3 to decrease variables and considering them as a latent variable. The researcher knows that which question is related to which dimension in factor analysis. It means that there are conceptual model for each concept or variable of research in confirmatory factor analysis. The main question to study each model is whether these models of measurement are appropriate or not? On the other hand, whether the research data is consistent with conceptual model or not? Generally, there are two types of indices to examine fitting of models.

Indices for good status

Indices for bad status

There are indices for good model such as GFI, AGFI, NFI, … more value of these indices show better status.

The recommended value is 0/9 for such indices. Also, there are indices for bad status such as x^2/df and RMSEA, so that their lower value shows models with better fitting. The permitted limit is 3 for x^2/df and it is 0.08 for RMSEA. Indices of good status and bad status (GFI, AGFI and NFI and x^2/df, RMSEA,) should be examined relative to each other in order to answer fitting of model.

Table 2: Descriptive informa-tion about respondent Category Frequency Percent

Number of Members of Projects			
1-2	14	7	
3-5	70	34.8	
-10	5	27.9	
11-20	35	17.4	
20+	2	12.9	
Total		201	100
Duration of Projects Completion (Months)			
Less than		40	19.9
-12	73	3 .3	
13-24	51	25.4	
24+	37	18.4	
Total	201	100	
Average Experience of Members of teams (Years)			
Less than 1		1	0.5

1-3	47	23.4		
4-	109	54.2		
7-9	34	1 .9		
9+		10 5		
Total			201	100
Used Methodology				
No methodology		23	11.4	
SPI models		4	2	
Agile	45	22.4		
RUP		32.8		
Other	3	31.3		
Total		201	100	

Goodness Indices of model fitting:

As it is observed, LISREL software presents series of indices to evaluate goodness of formulated model fitting. All the mentioned indices would be examined in following parts.

Chi-squared Index: It shows statistics of chi-squared for the model. In fact, this index shows difference between model and data and it is a criterion for bad model. Therefore, less amount of mentioned index indicates less difference between variance-covariance matrix of sample and variance-covariance matrix of model and it means there is a bad model. As a matter of fact, if volume of sample is more than 200, then the index would tend to be increased. Thus, analysis of fitting of model with this index is reliable for samples in range of 100 to 200. Also, it is better to interpret this index considering degree of freedom.

Degree of Freedom (df): This index shows degree of freedom and it shouldn't be less than zero.

Ratio of chi-squared index on degree of freedom (x^2/df): This statistical ratios is one of the best indices to examine goodness of model fitting. Although there is no standard limit to evaluate this index, but many scientists believe that it should be less than 3. Appropriate limit should be determined finally by researcher's opinion based on type of research.

Index of Root Mean Square Error of Approximation (RMSEA): This index has been formed based on model errors and it is an index for bad model as well as chi-squared index. Some researchers believe that this index should be less than 0.05 while some other researchers think that amount less than 0.1 is suitable.

Index of Goodness-of-Fit (GFI): This index is a criterion to evaluate amount of goodness of model, and value more than 0.9 shows extracted model is appropriate regarding data.

Index of Adjusted GFI (AGFI): This index is actually adjusted state of GFI index considering degree of freedom (df) and it is another criterion for goodness of model. If this index is more than 0.9 then it shows extracted model is appropriate regarding data.

Index of Normed Fit Index (NFI): Another index to evaluate amount of goodness of model regarding data. If this index is more than 0.9, then it shows extracted model is appropriate. [11]

Measurement model of research variables:

Figure 2 shows measurement model of variables of research for position of standard estimation. The model shows factor loading for position of estimation of standard. Factor loading for position of standard estimation shows influence for each variable and/or item to explain variance of value of variable or main factor. In other words, factor loading shows amount of correlation of each observer variable (question in questionnaire) with latent variable (factors). Coefficients have been consistent in position of standard estimation, thus, comprehension is possible. According to figure 2; factor loading may be observed for each research questions. For example, factor loading of first question is 0.73 as for challenge of documentation. In other words, the first question determine 54 percent of variance of challenge as for documentation. Value 0.4 is amount of error. (Amount of variance that is not explainable by first question) Obliviously, less value of error increases the coefficient of determination, so there is more correlation between question and related factor. Value of coefficient of determination is a number between 0 and 1 and if this number is close to 1, then determination of variance would be more.

Figure 3 shows significance of coefficient and parameters of measurement model of variables of research in which, all coefficients are significant or in other words, all hypotheses have been confirmed. If value of significance test is more than 1.9 or less than -1.9 , then relation would be significant. Critical values are 1.9 and -1.9 with error value of 0.05 and mutual test (normal assumption) If significance coefficients will be more than 1.9 and/or less than -1.9 , assumption of null will be rejected and hypothesis of one will be confirmed i.e. a significant relation.

Results of estimation (or fitting of the model) show indices are appropriate relatively. According to output of LISREL, value of x^2 calculated is 3 .02 that is less than 3 with regards to degree of freedom (390). Value of RMSEA is 0.05 . The permitted limit of RMSEA is 0.08. Indices of GFI, AGFI and NFI are respectively 0.92, 0.9 and 0.95 and it means that there is a relative high fitting.

Table 3 shows summary results of factor loading and significance coefficient of challenges related to computer software development. As it can be observed all coefficients are significance and factor loadings are greater than 0.3. An indication of all questions of questionnaire have validity.

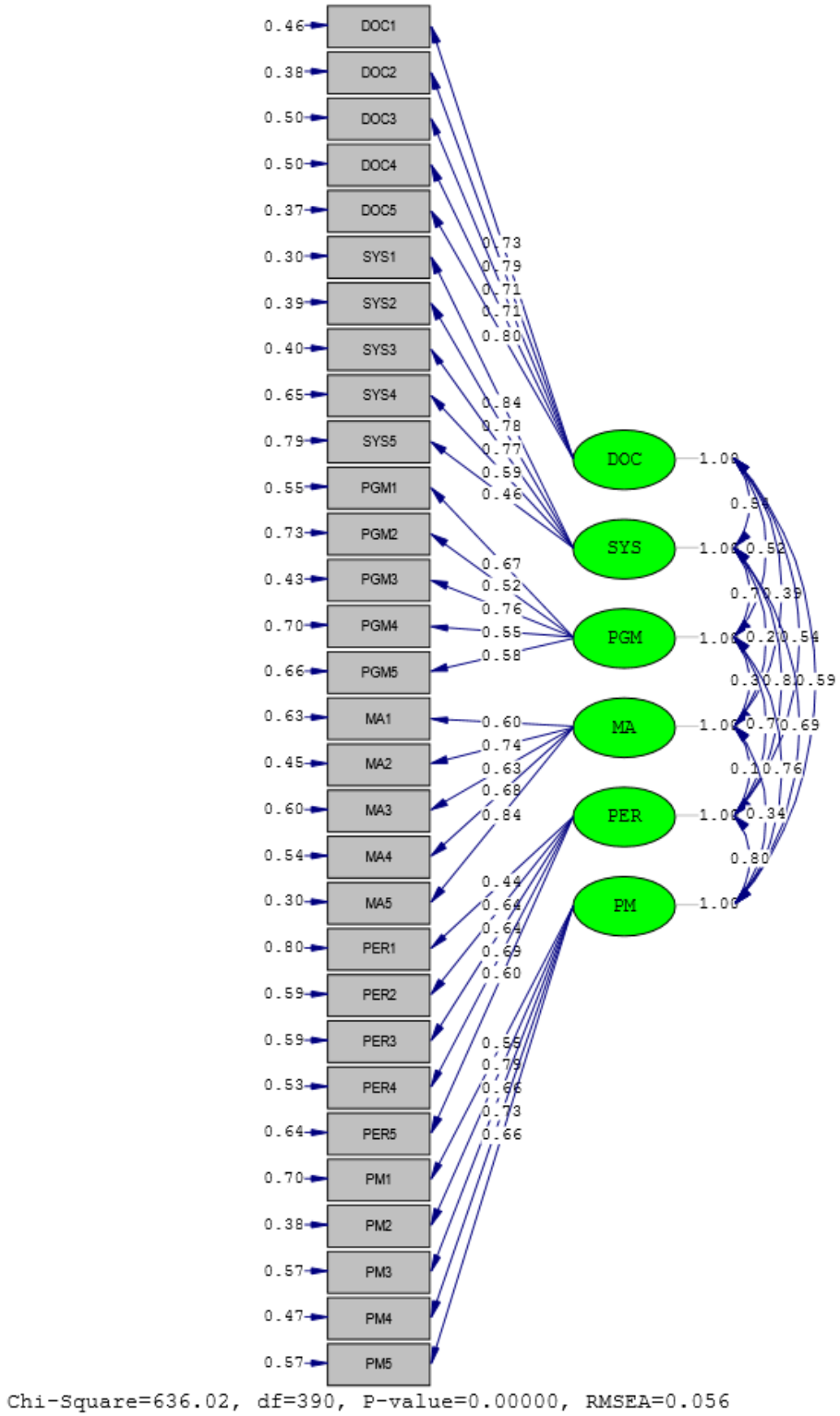

Fig. 2: Measurement model of variables of research in position of standard estimation.

Advances in Environmental Biology, 8(25) Special 2014, Pages: 352-363

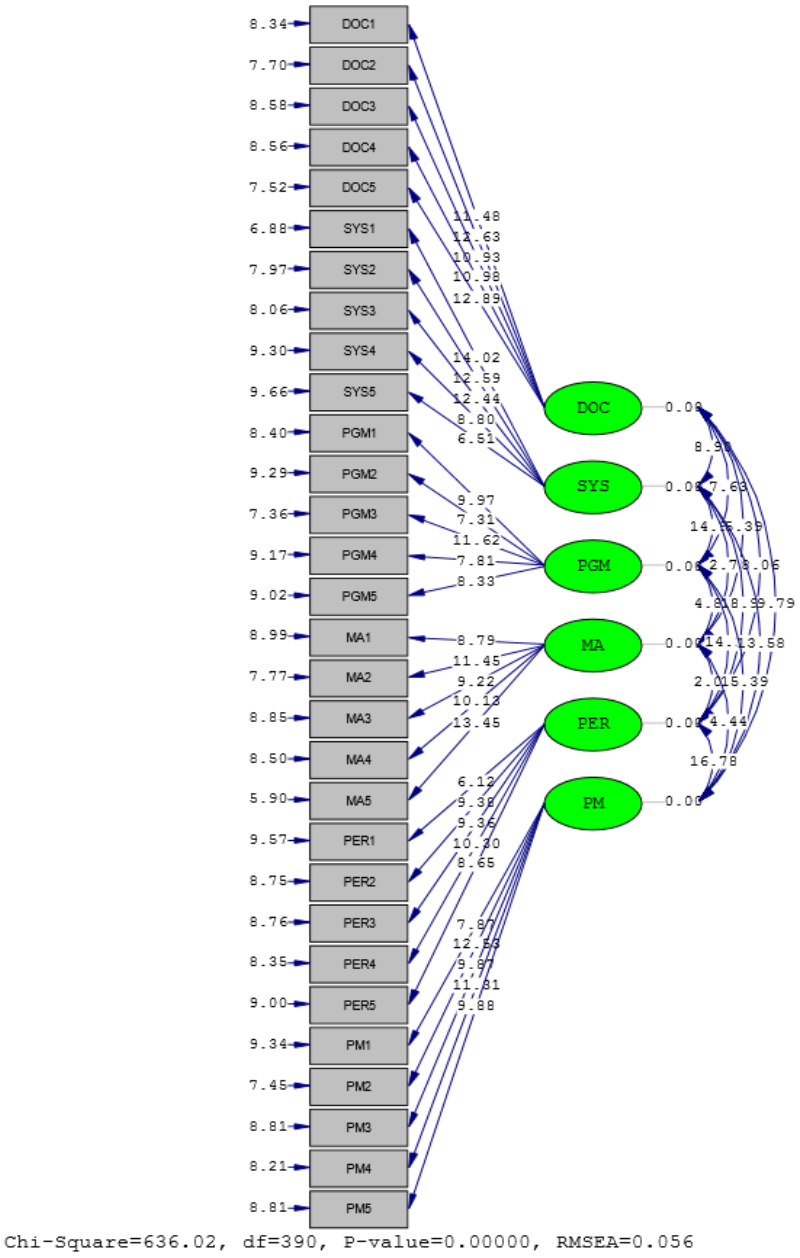

Fig 3 Measurement model of variables of research in position of significance coefficient

Table 3 Factor loading and significance coefficient of challenges related to computer software development

Indices	Challenges	factor loading	significance coefficient
1.The project has been documented unreliably or obscurely	Challenges related to DOC	0.73	11.48
2.There has been no documentation or they have been incomplete		0.79	12. 3
3.Tracking previous documentation in project is hard concerning design specification & users' requirements		0.71	10.93
4-Changes have not been documented completely		0.71	10.98
5-Documentation are not consistent and comprehensive		0.80	12.89
-System requirements have been recognized mistakenly	Challenges related to SYS	0.84	14.02
7- System requirements have been recognized incomplete or obscure		0.78	12.59
8- System requirements have been recognized unreal or conflict		0.77	12.44
9-Paying no attention to software quality requirements		0.59	8.80
10- System requirements are changed constantly		0.4	.51
11-It is not conforming to programming standards	Challenges related to PGM	0. 7	9.97
12-Comments are incomplete in relation to source code		0.52	7.31
13-Various modules are not allocated in program in a way that they be independent to each other concerning functionality and operationally		0.7	11. 2
14-The program is very complicated and restructuring is not possible		0.55	7.81

15- Inappropriate use of programming technique decreased ability of source code comprehension		0.58	8.33
1 -Submitted software systems are not comprehendible and analyzable easily	Challenges related to MA	0. 0	8.78
17- Submitted software systems are not changeable and optimizable easily		0.74	11.45
18- Submitted software systems are not sustainable and resistible against unexpected effects arisen from changes		0. 3	9.22
19- Submitted software systems are not testable easily		0. 3	10.13
20-Overally, submitted software systems are not maintainable easily		0.84	13.45
21-Frequent replacements happen in project team	Challenges related to PER	0.44	.12
22-Members of project team are not experienced or skilled sufficiently		0. 4	9.38
23- Members of project team have not passed appropriate educations		0. 4	9.3
24- Members of project team are not able to manage human resources & time		0. 9	10.30
25- Members of project team are not obligated toward the project		0. 0	8. 5
2 -There isn't managerial support and policies in software development process	Challenges related to PM	0.55	7.87
27-Project planning and control are not effective		0.79	12.53
28-There is no proper estimation of project execution schedule & cost		0.	9.87
29-It is not effective to control changes in configuration management software		0.73	11.31
30- Quality control verifications are not effective to be sure from qualitative level		0.	9.88

Exam of main hypotheses of research by structural equation modeling or SEM:

It is one of the most useful and powerful methods of analysis in researches concerning behavioral sciences and multi-variables analysis. Since, nature of such topics are multi-variables and we are not able to solve them with two-variable method in which only one independent and one dependent variable are considered. Hence, SEM and particularly path analysis have been used to confirm or reject hypotheses. Path analysis (structural model) is a technique that simultaneously shows relations among variables (independent, moderating and dependent). Briefly, method of path analysis has been used to recognize influences presented by variables in conceptual model of research and to examine the presented hypotheses.

Firstly, a summary of path analysis is presented in this part and then, presented hypotheses are examined. Path analysis was developed for the first time by Swell Wright (1934) and actually it is development of regression methods and in fact it is application of multi-variables regression in relation to special formulation of causal models. Its purpose is to calculate quantitative estimates of causal relations among a set of variables. Relations among variables are flowed in one direction and it would be considered distinguished paths. In the best way, concepts of path analysis are explained through their major characteristic i.e. path diagram that reveals probable causal links among variables. In order to produce diagram of path; names of variables should be written, next arrows should be drawn from each variable to the other variable that is under the influence of the first one. Although path analysis has become prevalent and has been generalized, but it should be noted that; data of correlation are principally just correlation and this statement has been said many times that the correlation doesn't confirm the causality.

If variables of A and B are correlated, it is possible that A is cause of B or vice versa or perhaps both A and B are effects of a third variable of. C. Causal modeling for research purposes is called to each approach of causal inference which are arisen from various types of data correlation that may entails relations among observables (variables or markers in words of LISREL) or factors (structures). Although it is not an exact notation, but here, expression of path analysis is limited to application of multi-variables regression to extract causal relations among observed variables.

Path analysis may explain which path is more important (or more significant) and that it may explains predetermined causal hypotheses are justified, but it is not able to explain whether correlation between A and B shows influence on B by A or on A by B or mutual interrelation of variables of C, D or a combination of them.

No plan is able to account variables which have not been considered in analysis and path analysis should not be an alternate for researchers' opinion concerning causal relations among a set of variables. Path analysis is study on pattern of relations among several variables while this probable relation among them, would not be rejected or confirmed. It is clear that if it is possible to show two or several predetermined causal hypotheses in a diagram of input path, relative values of coefficients of path in output diagram may explain which one of them is supported better by data.

In order to study influences of research independent variables (documentation, system requirements, programming quality, personnel resources and process management), and based on research introduction and background that has been presented earlier, hypothesized models has been designed.

Null hypothesis and one hypothesis to confirm or reject research hypotheses are obtained as follows:

H0: There is no significant relation between two variables.

H1: There is a significant relation between two variables

If significant value of exam (T coefficients) is more than 1.9 in regression testing, then hypothesis of null is rejected and hypothesis of one is confirmed and vice-versa. Table 4 shows briefly confirmation or reject of relations among variables of research.

Advances in Environmental Biology, 8(25) Special 2014, Pages: 352-363

Table 4: Examination of confirmation or reject of hypotheses.

Hypothesis	Description	Level of Influence (Standard Estimation)	Significance	Confirmation or Reject
H1	DOC has a positive effect on MA	0.28	3.53	Confirmation
H2	SYS has a positive effect on MA	-0.04	-0,44	Reject
H3	PGM has a positive effect on MA	0.21	2.32	Confirmation
H4	PER has a positive effect on MA	0.19	1.99	Confirmation
H5	PM has a positive effect on MA	0.1	1. 7	Reject

Therefore SEM has been selected for this research as a statistical method due to independent and dependent variables, various latent variables and also suggested multi-variables model.

There are various methods to perform SEM. One of the available methods is covariance-based SEM and it is used for normal variables and volume of mentioned samples. Hence, LISREL method has been used in this research to solve the model. Performing SEM with covariance-based method requires certain software of which, LISREL software is used more than other software. So, it has been used in present research to form SEM.

As it is cited in previous parts, structural model in position of standard estimate and significance coefficients will be discussed to examine mentioned hypotheses. Figure 4 and figure 5 shows rate of influence by output latent variables (documentation, system requirements, programming quality, personnel resources and process management,) on input latent variables (maintenance).

As evident from the values of the standardized regression weights in figure 4, challenges of documentation quality is the most influential factor affecting challenges of maintenance, with the next most important factor being challenges of programming quality, followed by personal resources.

Which software development phases have the most significant influence on maintenance phase?

Path analysis may explain which path is more important (or more significant) and that it may explains predetermined causal hypotheses are justified, as it can be observed according to path analysis the challenges of documentation have the most affect on problem factors of maintenance phase. So to reduce the challenges related to maintenance phase, the challenges related to documentation should be reduced firstly. The challenges of programming quality have also more affect on challenges related to maintenance phase. For to reduce or remove it, challenges of programming quality should be decreased. The problem factors of personnel resources with less degree also should be considered in order to reduce challenges concerning maintenance.

Testing the research hypotheses by SEM; output of software shows the fitted structural model is appropriate for testing the hypotheses. Ratio of x^2 to df is less than 3. Also, value of RMSEA=0.0 8 shows the structural model is appropriate. In other words, the observed data conforms to data of research conceptual model significantly. Values of GFI, AGFI and NFI are respectively 0.91, 0.93 and 0.95 that shows the fitting of model is relative appropriate. Table 5 shows summary of indices of model fitting.

Table 5: Indices of fitting of research general model.

Obtained value	Standard value	Index
2. 7	Less than 3	X^2 / df
0.0 8	Less than 0.1	RMSEA
0.91	More than 8	AGFI
0.93	More than 9	GFI
0.95	More than 9	NFI

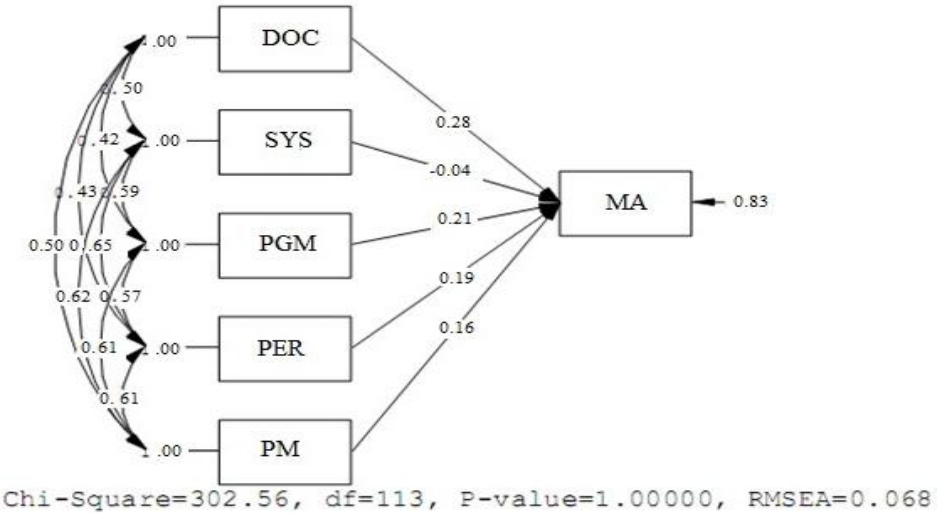

Fig. 4: Path diagram in position of standard estimation.

Advances in Environmental Biology, 8(25) Special 2014, Pages: 352-363

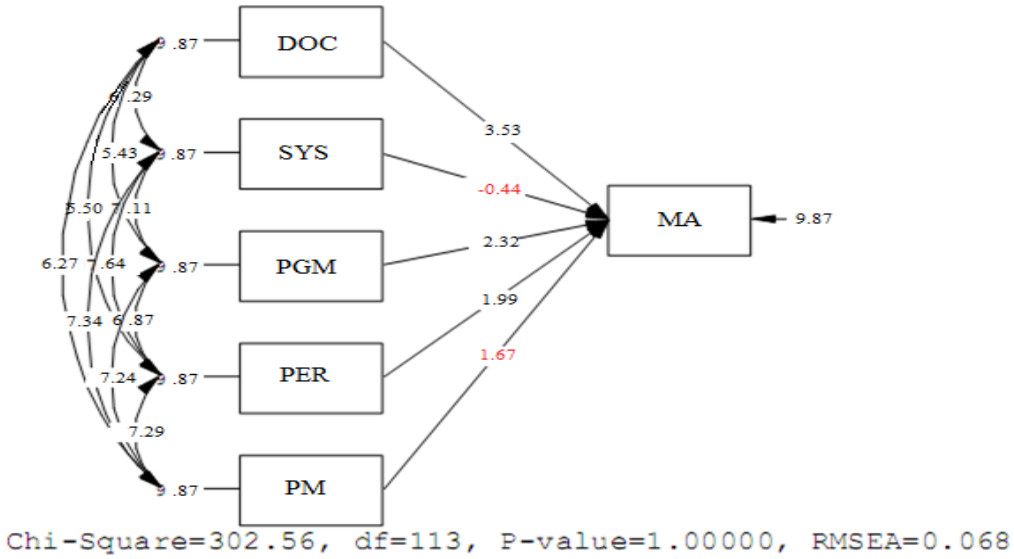

Fig. 5: Path diagram in position of significance coefficients.

Discussion and Conclusion:

Besides quantative analysis of scientific outputs, paying much attention to qualitative factors that affect these outputs is located among objective of Scietometrics. Basically any scientific research leads to qualitative improvement, therefore examining and monitoring of challenges related to computer software development terminate in promotion of quality and as a result enhancement of scientific outputs.

As regard to demographical specifications; the highest frequency of number of members of project teams belongs to teams with 3 to 5 members (35%), also, computer software projects have been completed often in period of -12 months (3 .3%). More than half the software developer teams have experiences 4 to years (54%) and they often have used RUP methodology (32.8%) in software development.

According to findings to overcome challenges of maintenance phase in computer software development in Iran and presenting appropriate solutions, lack of documentation is the most important challenges for computer software developers. Documentation is set of information, notes and diagrams that describe function, application and keeping a software (or hardware). Examining activities qualitatively and quantitively both verifies reason of a certain strategy and presents detailed data of software due to save and record approaches in all phases including planning, programming, setup and installation and maintenance. Employers always try to decrease their need to contractors after software system installation in organization or affiliated units and they try to be independent enough to keep and support received software and this subject is possible merely by presenting accurate and suitable documentations including documentations related to system requirements, planning, construction such as documentations related to source code, and also implementation, testing and system maintenance by contractor. On the other hand, it seems that contractors try to decrease employer's independency on the subject due to keep themselves and their job. Thus, perhaps job insecurity is one reason of lack of documentations.

Also based on results part of challenges of maintenance phase is related to challenges of programming quality. Lack of modularity to divide the program into functionality and operationally independent components, lack of conforming to standard programming, adequacy of source code command are among the most important ones.

Considering the fact that attention to personnel is one important principle in project management, due to companies' reliance on manpower's skill and specialty and necessity to encourage and motivate them organizationally in business environment, they try to keep their personnel by various techniques and methods but many personnel leave the organization when faced with better offers by other competitors and are employed in competitive companies. This is one the main concerns of mangers in governmental and private companies. Applying protection plan of manpower by Informatics Higher Council or any other authorities related to ICT may decrease worries and keep manpower in their companies.

Also part of other challenges are related to other infrastructural factors that their absence or incompleteness may affect on computer software development. Infrastructural difficulties and lack of necessary beds and inappropriateness of relations and legal impediments are considered as challenges that affect on computer software development. Thus, following items are recommended considering research results and verbal interviews with some software developer companies to decrease challenges related to computer software development and their quality promotion:

Ideally, computer software developer companies should allocate at least 25% of their capital to research and development but usually domestic companies don't cost for this purpose or they don't afford it sufficiently, however, governmental companies allocate more cost for R&D but they are far from ideal point.

It is suggested as it is necessary to have technical expert people including project manager, system analyzer, planner, and network expert etc. in software development process [5], in order to present technical strategies in against problems arisen in software development process subject matter experts (SME) must be employed in project group [7]. For example, if a company tends to develop a system in order to use in organizational accounting section, then it is more effective to employ experts graduated in accounting rather than technical personnel that have not already educated in the field.

Engineering System Standardization of Software Deployment and Development have been produced as several steps or phases by Informatics Higher Council for type of work assignment in relations between employer and contractor, and also software projects execution phases and supervising on making domestic national standards performed by Institute of Standard and Industrial Research of Iran (ISIRI) and etc. it is worthy of appreciation.

Although, protecting material and spiritual rights of software developer is an evident matter in constitution of Computer Trade System Organization, but activities of this organization is mainly to deal with less important subjects and to prepare companies to participate in domestic and international fairs and similar matters, and this organization considers challenges of software developers less than other matters and it doesn't try to persuade banks to give loans to software developers as well as other industries. Banks make loans payment dependent upon purchasing initial materials and equipment while there are no initial materials and equipment in software development that are conditions by banks. Also usually banks pay amounts as working capital until product sale and capital return, while these amounts are not paid to software developers. Also, ministry of mine, industry and commerce have limited loan payment to submit initial prototype of software by software developers companies, but submitting initial Prototype means the companies have passed the main part of software development while they need loans at the beginning of software development, even before the beginning. One important priorities of Trade System shall be negotiation with banks and Ministry of Mine, Industry and Commerce on the mentioned issues. Computer software developer companies have to refer to Informatics Higher Council annually to obtain qualifications license and rank, while this process of license is long-term and exhausting, so the companies should try to start procedures several months before the license expiration. It is necessary to arrange procedure in order of facilitation.

According to findings there are no significant relation between challenges of system requirement and process management phases and challenges of maintenance. An indication of software developers' awareness of the importance of these phases to keep software quality for long period after its release.

REFERENCES

[1] Chen, J.Ch., S.J. Huang, 2009. An Empirical Analysis of the Impact of Software Development Problem factors on Software Maintainability. *The Journal of Systems and Software*. 82.

[2] Collin, S.M.H., 2004. *Dictionary of ICT*. London: Bloomsbury.

[3] Eveleens, J.L., Ch. Verhoef, 2010. *The Rise and fall of the Chaos Report Figures*. IEEE Computer Society. IEEE Software, 27(1), January and February.

[4] Fanaee, A., A.H. Amir Khani, 2011. Survey on challenges and problem factors of IT managers in Iran. *Electronic Monthly of Scientific Communications*. 19(2). Retrieved from http://rayasamin.ir/ejournal?lssueld=299

[5] Hassani, F., 2005. Managerial challenges of software development in Iran" *Ketab-e Mah*, December & October.

[6] Kannabiran, G., K. Sankaran, 2011. Determinants of software quality in offshore development. An empirical study of an Indian vender. *Information and software technology*, 53.

[7] Marchewka, J.T., 2012 *"Information Technology Project Management"*. New York: John Wiley and Son, pp: 5.

[8] Mensah, E., 2003. *Software Development Failures: Anatomy of Abandoned Projects*. USA: Massachusetts Institute of Technology.

[9] Mohammd Esmail, S., N. Saboktakin, 2014. Computer development challenges in Iran, with respect to software metrics. Accepted in 10th International Collnet Conference.

[10] Sabaghchi, S., S. Ghazinoori, Sh. Elahi, 2011. Selecting knowledge management tools for software new products development*" Behbud-e Modiriat*, 5th year, No.2, series 13, Fall 1390.

[11] Schumacker, R.E., R.G. Lomax, 2004. *A beginner's guide to structural equation modelling*. Mahwah, New Jercy, London, Lawrence Erlbaum Associations.

[12] Stepanek, G., 2005. *Software project secrets: Why software projects fail.* Berkeley: Apress.

[13] Tahir, A., R. Ahmad, Z.M. Kasiran, 2010. An Empirical Study on the Use of Standards and Procedures in Software Development Projects. *International Conference on Software Technology and Engineering*. 2nd. Vol.1.
[14] Yip, S.W.I. and T. Lam, 1994. A software maintenance surveys. *Software engineering conference, 1994 Proceedings*, First Asia-Pacific.