OFFERING A SAFE AND AGILE METHOD IN DEVELOPING SOFTWARE REGARDING IRANIANS' CULTURE

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ABSTRACT

The current business environment is replete with risks and dangers. Being secure in an unsafe world, present what, how and why the designing, development and expanding of software systems. Agile methodologies are so effective in demands users in system and were accepted in software industries. And regarding fitness of these methods with Iranian culture, this is a compatible method. But agile methods often lack special features of software security, therefore, the security problem should be removed in a way. Considering security characteristics of three methods CRYSTAL, ASD, DSDM which are more effective agile methods in terms of security, and other methods of developing software, this article examines how to use agile methods with considering Iranians' culture to produce effective security requirements. To do so, a questionnaire has been used, and the data has been analyzed by using the software SPSS and LISREL, then a method has been presented in which identifying assets which have not mentioned in agile methods are added. Quantitative documentation which is in the method DSDM is used. There is resistance which exists in changing needs in DSDM, is considered, and current fitness filter in the method DSDM which causes dangers decline, rising interaction with customer and relationships among the CRYSTAL team, is added to our method. Education and security informing should be done in Iran.

KEYWORDS: Agility, Agile Methodologies, Security, Culture, Software Development

Application Security has emerged as a key component in overall enterprise defense strategy [1].Theresa Lanowitz of Gartner Incstates that "75 percent of hacks happen at the application". This is an important statistic that needs to be acted upon[2].

Companies which make a strong defense line learn to think like an attacker. Financial firms, retailers, telecommunication and IT companies can't run away from being hurt by software attacks. Among the chief consequences of this attack are damages to their brand, losing income, losing customer's data or network failure [1].

Security risk mitigation is a salient issue in systems development research[18]. The real cost for an organization is losing customer's confidence and trust. This loss can not be made up, and its evaluation based on money in impossible. Fundamentally, the recognition that the organization is obligated to protect the customers should powerfully motivate the organization in creating more secure software[3].

Various researches have proved that cultural differences affect the process and results of user research, emphasizing that should cultural attention be given in order to obtain sufficient results[4].Software development can encounter failure because of its essence and increasing variety of informational systems, labor force and their lack of knowledge of cultural effects in development and growth [5]. It focuses on the fact that you should pay enough attention to the users' different cultural backgrounds[4].

Regarding analysis of historical experiences and examining the results of some studies, Iran society has some features such as lack of proper standard for documentation, believing in short term tangible products and resistance to change (if change is definite then adaptation happens)[7].

Agile Methods (AMs) are a family of software development processes that have become popular during the last few years [14, 15, 16].One reason why the agile methods ignore security issues may stem from a misconception that it is, indeed, security that hinders the development [17]. This is true with most of the existing security methods [6, 13, 12].

The methodologies XP, SCRUM, FDD, DSDM, CRYSTAL, can be some examples of small processes [8].We focus more on the methodologies ASD, CRYSTAL DSDM. Examining security features of agile methodologies and other methodologies of developing

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software, it is intended to operationalize security features obtained from those methodologies in agile methodologies with considering cultural characteristics of Iranian people. To do so, a questionnaire related to offering a secure and agile method regarding Iranians' culture.

In chapter 2, the related works are studied, and some of the fundamental features of agile methods are introduced. Chapter 3 introduces some fields to increase security to agile methods through using questionnaires. Finally, in chapter 4, the results will be studied; in chapter 5 some ways to consensus are introduced: how to arrange the different methods so that they don't get omitted but adds security to the agile methods. In chapter 6, conclusion is done.

BACKGROUND AND RELATED WORK

Microsoft concluded its experiences dealing with produced security software and presented a process for engineering. This process has been completed and its final version was presented in 2006 [9]. This process contains 13 stages which have been done respectively and covers the software life cycle. Although these activities are coherent in this process and are able to be performed, this process lacks any stage to analyze needs. This issue is a part of the main parts of developing software which caused not to pay any attention to the different aspects of security and caused analysis and removal most dangers not to be done. The product obtained from this process can contain some other dangers, although there are a few security problems [8]. Mikko Siponena et al studied unifying security features in agile methods [10]. This paper offers an example of adding security techniques to the methods of developing agile software. Adding this solution to a method of agile development shows a method which is called feature-based method.

Mano Paul expresses top ten experiences for developing secure software, and maintains that although designing, developing and expanding the software can be done with regard to security, but factor analysis in urgent controls of security decreases exposing to risk and hit. These 10 experiences can help complete SSLP commission to develop resistant software against hacking [3].

Konstantin Beznosov et al took a step toward collecting security-making techniques and methods in developing agile methods. In addition, conventional methods and techniques used in making security are classified based on their acceptability for agile development and some ways are suggested for fitness of contradictory techniques [11].

MATERIALS AND METHODS

To increase the level of security in developing and expanding software, and with regard to Iranians' culture, security activities offered in different sources to increase security of produced product are collected, and then features obtained from these methodologies are operationalized in agile methodologies with regard to Iranians' culture. Finally an agile process is obtained with security features and minimal decrease of agility and compatibility with Iranian culture.

To do so, by using conceptual model of the research, a questionnaire has been developed which contains 38 items and has three factors of productivity and success in market (items 1 to 13), increasing the level of quality (items 14 to 25) and security (items 26 to 37). Cronbach's alpha coefficient is 80%, and its reliability has been proved. Content validity has been used in this study. Content validity of the questionnaire has been proved by 5 software experts. The questionnaire has been distributed. Face validity which is an important component of validity has been used in this study.

Statistic population of this research contains all agile professional people in Tehran. 100 questionnaires have been distributed randomly among these people. Questions analysis is as follows:

1- Are these 3 factors really the factors of agile software development projects success?
2- If so, what is relative importance of each of these factors over other factors?

To study the structure of the questionnaire factors, presenting a safe and agile method with regard to Iranians' culture, exploratory factor analysis has been done by the software SPSS21 and confirmatory factor analysis has been conducted by the software SPSS8.5 The conceptual model of the research has been shown in figure (1).

Figure 1: The conceptual model of the research
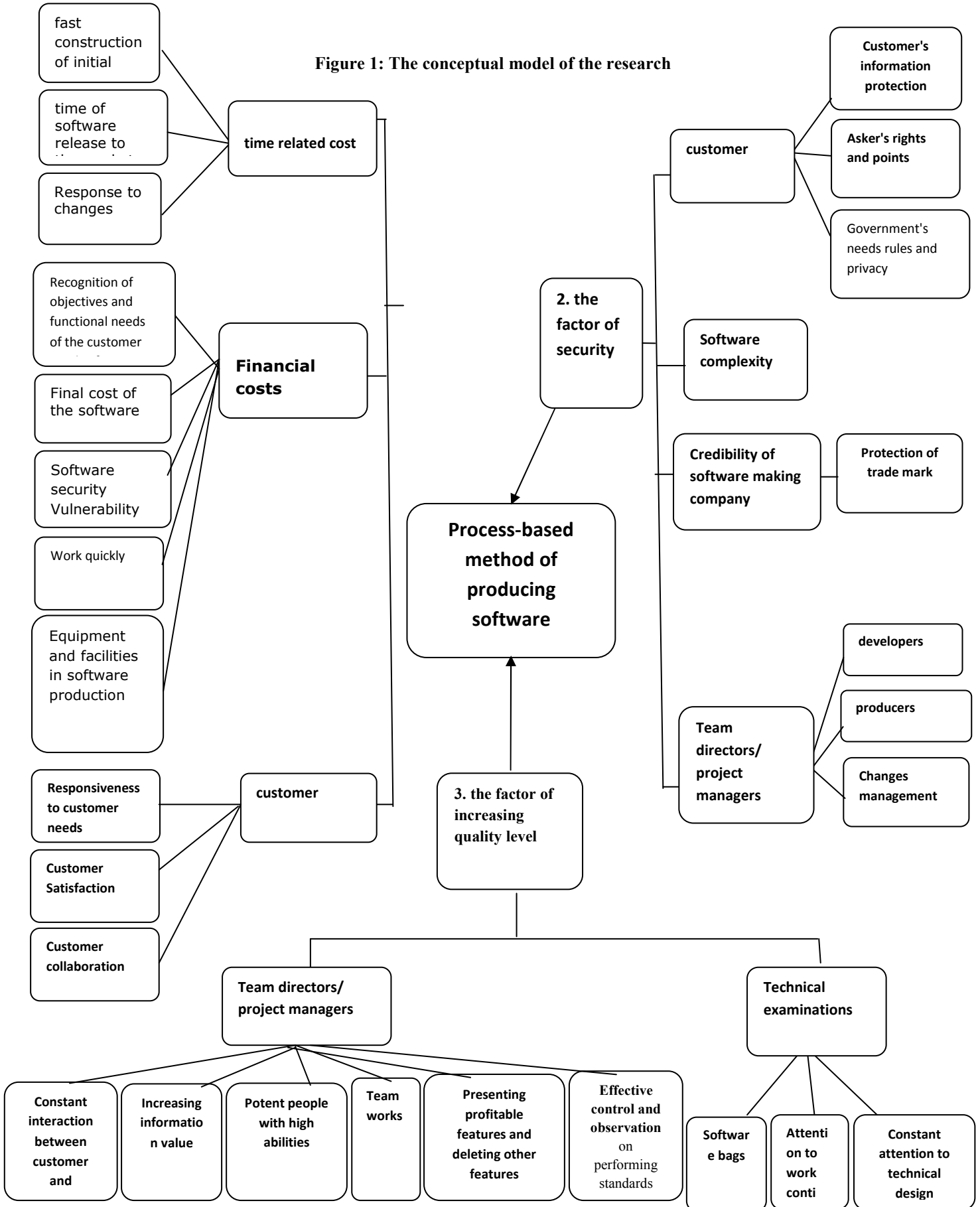
DATA ANALYSIS

Before doing exploratory analysis and to get assured of the fitness of data, to use this method, (KMO) test and Bartlett test have been done. KMO was 0.952 (kmo>0.05) and Bartlett was 4512.073 (p<0.001) for the factor productivity and success in market and this shows correlation among variables and data fitness for factor analysis.

In doing exploratory factor analysis, to determine the number of factors. first Scree diagram and then Warimax method have been used in which the items with values over 1 will be separated as factors. Scree diagram to determine the optimized number is showed in figure (2). As shown, the special value of the first axis is around 5, for the second axis is 4 and the third axis is 2.2 and the special value of the fourth axis is 1.5.
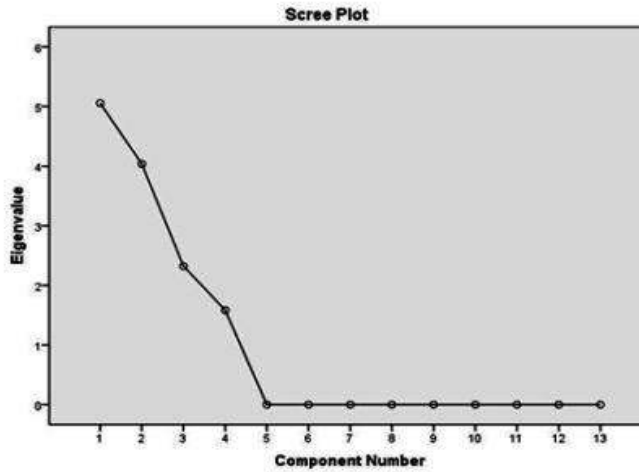
Figure 2: Scree diagram to determine the number of factors of the variable success and productivity in market

Breaking point shows the maximum number of the basic factors to be considered. Regarding the figure, the number of factors is 4.

Table (1) shows the obtained results of Warimax method. In this matrix, the variable of productivity and success in market has 4 factors. To determine each share of every question dealing with productivity and success in market, each question part has been divided into four factors after doing exploratory factor analysis for 13 questions.

Regarding to the share of above-mentioned questions, the initial factors 10,9,4,3,2,1,13 have the highest share on the variable success and productivity in market.

The questions 5,7,8 and 12 which belong to the second factor have a weaker role in the variable of success and productivity in market. In the third factor, the question 11, and in the fourth factor, the question 6 have the weakest and lowest role in success and productivity in market from respondents' viewpoints.

Table 1: factor load of each question with the order of each factor

fo urt h	thi rd fac	sec on d	Fir st fac	Questions
			%75	Q1: the effect of high interaction with customers on developing software, keeping royalty of customers and repeating his purchases
			%66	Q2: the effect of high speed of performance in making software on productivity and success in market
			%67	O3: the effect of high interaction with customer in software production on success possibility in existing competition in market
			%58	Q4: the effect of project performance in frequent repetition on cost decline of software production
			%74	Q 5:The effect of high interaction with customer on software production and on higher rate of sale
%73				Q 6:The effect of equipment and facilities on software production and on market success
		%84		Q 7:The effect of simple access to different types of software and instruments and its low price in Iran's software industry on project failure and competition in market

		%87		Q 8:The effect of lack of public beliefs about software value and not observing copyright which is the case in Iran, on the rate of sale and on software productivity
			%78	Q 9:The effect of ease of using software on rate of sale and software productivity
			%60	Q 10:The effect of ease of using software on the customers' satisfaction and trust
	%49			Q 11:The effect of a software abilities on the possibility of success in existing competition in market
		%80		Q 12:The effect of lack of technical support about software stages in Iran's industry in productivity and success in market
			%80	Q 13:The effect of emphasis on fast delivery of products which is one of the features of DSDM method on market productivity and success

The final structure of factors is shown in the factor load matrix. Figure (3) shows this matrix which contains the determined variance share of the variables by factors.
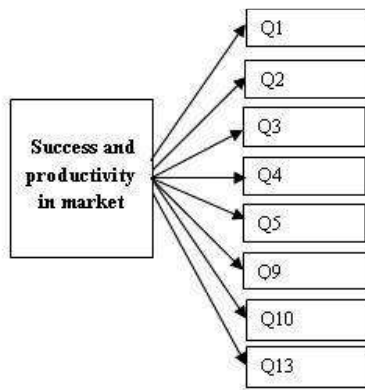

Figure 3: Classification of productivity and success factor in market based on Latent factors

After identifying the given factors, to get assured of fitness of data with collected data, it is necessary confirmatory factor analysis should be done by the software LISREL8.5 the figure (4) indicates variables and the questions structural model of the factor success and productivity in market and its effect on software. Regarding the findings of the current research, the questions 4,5,6,9,11 have suitable factor load from respondents' view to produce undiscovered software and question 11 has negative factor load.
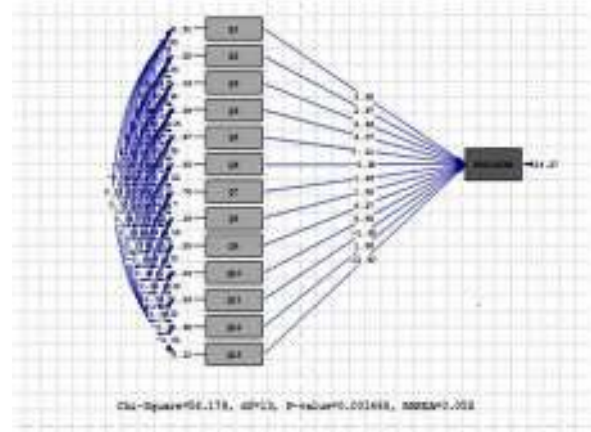

Figure 4: Structural Model of productivity and success factor in market analysis using lisrel

To study fitness of sample with observed data, goodness of fit indexes are used. Indexes of error root average (RMSEA) goodness of fit index (GFI), advanced goodness of fit index (AGFI) non-soft goodness of fit index (NNFI) comparative goodness of fit (CFI), and (x2 / df) as the indexes of sample fitness with the data are suitable which are inserted in the following table (2).

Table 2: Fitness indicators of the measurement model in productivity and success factor in market

Reference	Recommended value	Model value	Goodness of fit indexes
Hatcher1994 , bentller 1990	>0.9	0.98	CFI
Hu, bentller 1998	<0.06	0.052	RMSEA
Segars& Grover ،1993 Chou1997	>0.9	1	GFI
Segars& Grover ،1993 Chou1997	>0.8	0.91	AGFI
Bentler&Bonett ،1980، Chou1997	>0.9	0.96	NFI
Chou1997	>0.9	0.99	NNFI
Mash &Hocever،1985 Bentler1990	<5	2.87	χ^2/df
Segars& Grover،1993 Chou1997	<3		
Hu, bentller 1998	<4		

KMO was 0.259(KMO>0.05) and Bartlett was 2518.653 (P<0.001) for the factor increasing the level of quality and this shows correlation among variables and data fitness for factor analysis. In doing exploratory factor analysis, to determine the number of factors, first Scree diagram and then Warimax method have been used in which the items with values over 1 will be separated as factors.

Scree diagram to determine the optimized number is showed in figure (5). As shown, the special value of the first axis is 6.7, for the second axis is 2.3 and the third axis is 1.7.

Breaking point shows the maximum number of the basic factors to be considered. Regarding the figure, the number of factors is 3.
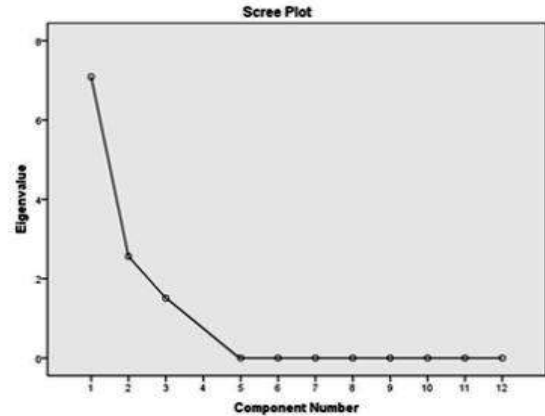
Figure 5: Scree diagram to determine the number of factor increasing the level of quality

Table (3)shows the obtained results of Warimax method. In this matrix, the variable of increasing the level of quality has 3 factors.

**Table 3: factor load of each question with the order of each factor**

third factor	second factor	first factor	Questions
		%89	Q14: The effect of human relationship among a team members axis on agile methodologies instead of usual modeling and documents in traditional process, on making motivation among the team members and on increasing cooperation among the members
		%87	Q15: The positive effect of flexibility and repetition as one of the features of agile methodology on increasing the level of software quality
		%96	Q16: The effect of doing project in different repetition on increasing the software quality
		%89	Q17: The effect of the lowest amount of modeling in agile method on increasing the software quality
		%94	Q18: The positive effect of oral interaction among the team members on increasing cooperation among the members
	%93		Q19: The impact of effective control and administration on standard execution in software production and quality improvement
%83			Q20: The effect of controlling and effective observation on operating standards on software production and software services in Iran on the software quality
		%85	Q21:The effect of identifying capitals and classification on the way of using technology in an acceptable way in access to a more effective software
		%64	Q22: The effect of attention to the users ' needs and its priority which are in agile methods on increasing the software quality level
		%69	Q23: The effect of repetitive and incremental development on DSDM on increasing the software quality level
	%91		Q24: Impact of communication distribution and interaction between stakeholders in DSDM in enhancement of the quality level of software.
		%91	Q25: The effect of holding review sessions in a documented form which is the main key of flexibility in ASD on increasing the software quality level

Regarding to the share of above-mentioned questions, the initial factors 14,15,16,17,18,21,23,25have the highest share on the variable increasing the level of quality.

The questions 14, 19 which belong to the second factor have a weaker role in the variable of increasing the level of quality. In the third factor, the question 21 have

the weakest and lowest role in increasing the level of quality from respondents' viewpoints.

The final structure of factors is shown in the factor load matrix. Figure (6) shows this matrix which contains the determined variance share of the variables by factors.
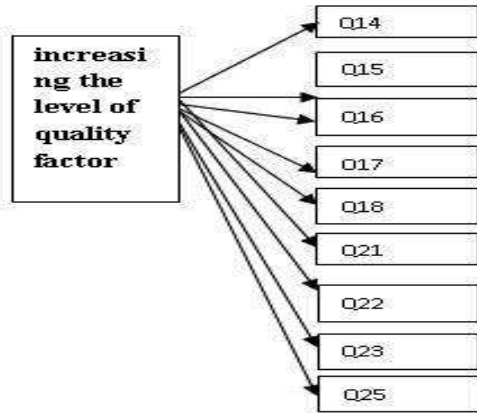
Figure 6: Classification of factor increasing the level of quality based on Latent factors

The structural model of the analysis was examined with the results which were achieved using LISREL so figure (7) shows the variables and the structural model of the quality improvement questions and its impact on the software.
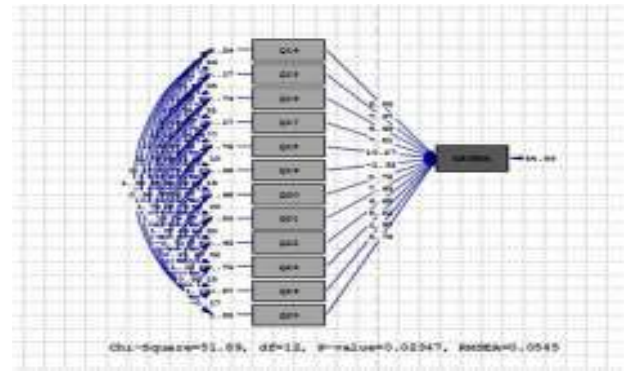
Figure 7: Structural Model of increasing the level of quality factor analysis using lisrel

According to the findings of the present study, only the question 19 has negative effect while the rest of the questions are positive.

Also, in table (4) Estimation parameters for structural model of security related to questions shows the structural model for the question 12 in questionnaire is meaningful in relation with quality level improvement and software production.

Table 4: Fitness indicators of the measurement model in quality level improvement

CFI	NNFI	NFI	AGFI	GFI	RMSEA	χ^2/df	Goodness of fit indexes
0.93	0.93	0.97	0.92	1	0.054	4.32	Result

According to the results and its comparison with acceptable domain, it can be stated, all the fitness indicators in the model are acceptable so the fitness of the collected data is desirable. Therefore the fitness of the quality level improvement model is verified.

The third factor is security. in this factor KMO was 0.586 (KMO>0.05)and Bartlett was 7421.696 (P<0.001)for the factor security and this shows correlation among variables and data fitness for factor analysis.

Scree diagram to determine the optimized number is showed in figure (8). As shown, the special value of the first axis is around 5.1, for the second axis is 4 and the third axis is 3.5 and the special value of the fourth axis is 1.5.
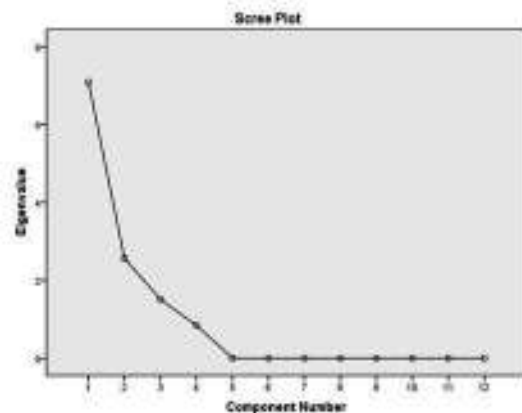
Figure 8: Scree diagram to determine the number of security factor

Breaking point shows the maximum number of the basic factors to be considered. Regarding the figure, the number of factors is 4.

Table (5) shows the obtained results of Warimax method. In this matrix, the variable of increasing the level of quality has 4 factors.

Table 5: factor load of each question with the order of each factor

fourth factor	third factor	second factor	first factors	Questions
			%84	Q26: The effect of using huge documents on software production on decreasing threatening factors
	%70			Q 27: The effect of the relatively small project team which is one of the features of agile methodology on protection against divulge
			%69	Q 28: The effect of resistance against needs on software security
		%60		Q 29:The effect of lack of clarity of information trend in Iran market on confidentiality and software security
		%52		Q 30:the effect of local production on software support including error removal and software development
			%76	Q 31:The effect of awareness of business and its support on software security
		%68		Q 32:The effect of the needed people to design and produce the software on decreasing security dangers of software
			%85	Q 33:The effect of required time on software production
			%76	Q 34:The effect of number of software instructions on software security
		%81		Q 35:The effect of non-sufficient considerations from security issues about viruses and worms on software security
			%65	Q 36:The effect of following legal necessities to improve human understanding to identify risk on decreasing threatening factors
		%79		Q 37:The effect of identifying and analyzing factors on decreasing security dangers of the software
%68				Q 38:The effect of planning flexibility to needs change which are in DSDM, ASD, CRYSTAL on software security increasing

Regarding to the share of above-mentioned questions, the initial factors 26،28،32،34،35،37have the highest share on the variable security.

The questions 29،30،31،33،36and 38 which belong to the second factor have a weaker role in the variable of security. In the third factor, the question 27, and in the fourth factor, the question 39 have the weakest and lowest role in security from respondents' viewpoints.

The final structure of factors is shown in the factor load matrix. Figure (9) shows this matrix which contains the determined variance share of the variables by factors.
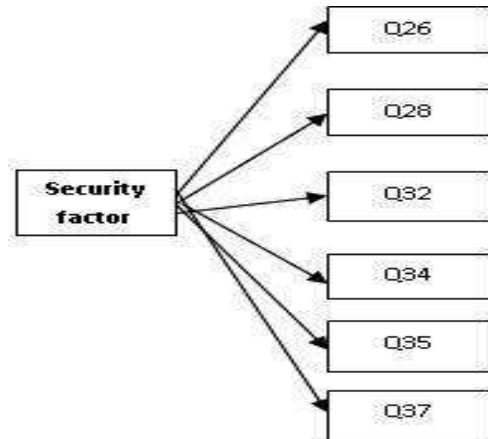
Figure 9: Classification of security factor based on Latent factors

The structural model of the analysis was examined with the results which were achieved using LISREL so figure (10) shows the variables and the structural model of the security questions and its impact on the software.
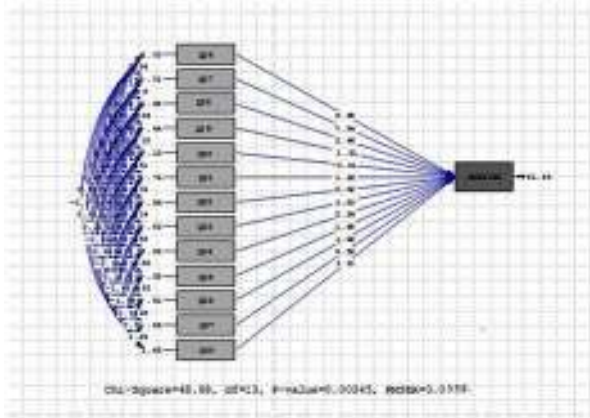
Figure 10: Structural Model of security factor analysis using lisrel

According to the findings of the present study, only the question 30 has negative effect while the rest of the questions are positive.

Also, in Table (6) Estimation parameters for structural model of security related to questions shows the structural model for the question 14 in questionnaire is meaningful in relation with security and software production.

According to the results and its comparison with acceptable domain, it can be stated, all the fitness indicators in the model are acceptable so the fitness of the collected data is desirable. Therefore the fitness of the security model is verified.

Table 6: Fitness indicators of the measurement model in security

CFI	NNFI	NFI	AGFI	GFI	RMSEA	χ^2/df	Goodness of fit indexes
0.92	0.96	0.99	0.94	1	0.0558	3.49	Result

SUGGESTIONS

What can be said as the products of this study is presenting an agile method which is compatible with Iranians' culture. The suggested method is in table (7).

Table 7:

Factors	Added	Crystal	ASD	DSDM	Descriptions
Resistance against change of requirements				√	This factor is one of the most effective factors on software security that is why the methods with lower flexibility to requirements changes are suitable. Because flexibility in DSDM is lower than the other two methods. In this suggested method we use flexibility in DSDM
Assets identifying	√				In the factor of assets identification quality and classification for the way of using technology in an acceptable way, this factor has been recognized as an important factor in accessing to a more effective software. Because asset management causes project to be faster and a higher effectiveness, as this issue has not been considered in agile method, it is suggested it is added to our method
Fitness filter				√	It is used to study fitness amount of methodology for the project we have. As fitness filter is one of the methods of decreasing dangers there is DSDM in fitness filter, this method is added to the suggested method of fitness filter
Documents				√	Existence of huge documents is of important effective factors in software security. But as huge documents is hard and time-consuming and there is no standard for documentation in Iran, it is suggested the method DSDM to be used in which documentation is lower than other methods
Modeling		√	√	√	The lowest modeling in agile method affects software quality level increasing. Agile methodologies try to minimize modeling specially in designing
Factors analysis in the danger of error		√	√	√	As incompatibility of software criminals' verdicts with the crime size, it is suggested factor analysis identifying skill should be more considered. In all three methods, important risks have been identified.
High interaction with customer and interaction among the team members		√			In all three methods, high interaction with customers and relationships among the team members, but this aspect is reflected in CRYSTAL more than others
Fast delivery of products		√	√	√	All three methods emphasize on fast, on time and continuous delivery of software to the users.
Awareness of business and supporting it	√		in Iran		It affects software security and should be considered
Education and public informing	√		in Iran		Making a security culture is possible through education, not only others should be educated but also knowledge should be distributed, as Modes Operandi states change causes change. When a person is educated educates others, creating security culture finds more and more importance [3].

CONCLUSION

The current paper presents an agile and safe method regarding Iranians' culture. The positive point of this method is its high applicability in Iran which results from considering Iranians' culture in the methodology. To do so, the selected agile methods (DSDM, CRYSTAL, ASD) used in producing software products have been considered so that agility and Iranians' culture are considered. Therefore, in this method, identifying assets which was not mentioned in agile method, is added. In addition, documentation which is used in DSDM, is used here. There is resistance against requirements changes in DSDM method. This resistance is considered in the suggested method. Fitness filter which causes dangers to decrease in method DSDM, high interaction with customers and relationship between team members in CRYSTAL method are added to our suggested method.

In Iran, security education and public informing should be done, and business awareness and its support for making more secure products should be considered. As the whole set of required skills to make a secure and qualified product rarely can be found in one person or one group. The main aim of the software-making group is producing the correct function of product and its on-time delivery, and the duty of security team is deleting problems and operationalizing security controls in software after finishing applied program. As a result, to decrease the security faults effectively during the production process, not only cooperation between these two groups but also the manager's support and emphasis on the software quality level increasing during production process seems necessary.

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