International Journal of Mechatronics, Electrical and Computer Technology

Vol. 4(12), Jul, 2014, pp. 1057-1071, **ISSN**: 2305-0543

Available online at: http://www.aeuso.org

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A Method for Increasing Modifiability in Enterprise Architecture Implementation Using Cloud Computing

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Abstract

Present period is overflowing of continues changes that have been occurred in business environment and technologies to business. Organizations for following their practices are forced to manage these changes. Changes management in organization requires tools that one of those is enterprise architecture. It is a tools to manage business changes around technologies. But if enterprise architecture itself as tools for changes management has not have due efficiency and flexibility, it should be a barrier to progress the changes. Thus, it is required to make method and tools to increase modifiability in enterprise architecture. Therefore, tools and methods that are flexible make easier and more flexible to achieve the objectives and changes ' management become easier. In recent work, using cloud computing and service oriented architectures Proposed an algorithm to implement EA. then mapping supports this implementation and shows the documents for it. Cloud computing as a modern field of involvement quickly and is one of the most prominent feature cloud computing is flexibility. Now if it has been applied as a device in EA it will surely enhance flexibility in EA. As a result, EA and cloud computing should be joined in a suitable method. Business, data and application layer as whole, designing and logic in implantation of EA should be considered and in architectural layer of technology it is address in the implementation's details. Thus applying cloud computing has been investigated in this layer to implementing EA. certainly ,for having modifiable architecture ,it is required to design modifiability in Business layers data and application as well. It can transfer changes in this layer appropriately to technological one. Meanwhile, using service oriented architectures is beneficial. In a similar work, there is different architecture for measuring modifiability AHP method is proper to evaluate in terms of all criteria. In this article, Proposed method are compared with similar those of implementing EA. Obtained results indicate modifiability in implementing EA by cloud computing.

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Keywords: Enterprise Architecture implementation, Cloud computing, modifiability, service oriented Enterprise Architecture.

1. Introduction

Information systems are of main source in organization EA is addressed to improve design and management of information systems and increasing effectiveness and quality in the trend of activity in every organization [5]. "EA is a perfect description of organization and a set of descriptive models in relation to explain an organization that can be adaptive to made management requirements and sustainable in the lifetime" [8]. Regarding made managements needs slow process of EA is due to continuous change in the area of IT and organization emissions that are a barrier for organization.

"The feature of business activity in cloud computing, is actually away of changing the firm by using information systems. This issue needs to connect to EA in firm and feathers of cloud computing" [7]. From advantages of cloud computing organization is to raise business's legerity, scalability and increasing flexibility" [2]. According to continues business change and IT and needing EA to follow these changes and the feature of business activity in business in cloud computing. The guidelines that support EA in cloud environment and implement lead to increase flexibility and modifiability of organization meeting these continues changes

2- Modifiability of EA

It means the readiness of applying the change to EA's elements for correcting errors, improving proficiency or other characteristics or other characteristics or compromising to environmental changes. In other words, if the cost of effect of changes is lower on each organizational architecture element, modifiability will be higher The aim of EA is an outcome based on EA framework.[4]

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EA's elements that are applied in implementing EA are in the view of technology architecture. Modifiability in this view has been defined as follows:"readiness of applying the changes to technological elements including network structures and protocols, hardware/software infrastructures in order to correct the errors, improve efficiency or their features or corresponding with environmental changes" [4].

Using Proposed method leads to increase modifiability due to using following:

•Using cloud computing

•Using service oriented EA

•Using Proposed algorithm

•Using Proposed mapping

2-1- Using cloud computing

Cloud computing is some features that lead to increase modifiability, such as ability to add new capabilities or capacities quickly, scalability and service orientation

1-This feature makes business powerful to give quicker and more effective reaction to changing environment

2- From feature of cloud computing is to increase business activity, scalability and flexibility [6]

3-cloud computing are service-oriented architecture that use the sources base on the internet including services, practical programs, tools and soon [2] and service orientation uses again all supporting services and increase the change of adapting feature changes with less efforts it can be concluded that cloud computing regarding their features can be used as a flexible and efficient tools for implantation of EA

2-2- Use of Service oriented Enterprise Architecture (SOEA)

Service oriented Enterprise Architecture adds feature flexibility to the EA.

"Concept of Enterprise Architecture Service oriented can be used to Providing Flexibility in organizational change and reflect coordination between technology and business." [1]

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This feature of the service-oriented architecture also increases the reusability of propagation also helps prevent changes. Changes in each service in the service are done and cannot be passed to other services.

2-3 Use of Proposed algorithm

Proposed algorithm indicates EA implantation by using service oriented EA and cloud computing the way of practical solution. (In order to done studies, there is no similar method) also, Proposed algorithm generates the documents that are comparable to relevant EA

These mappings lead to increase the quality of supporting documents of EA and are suitable for cloud computing service oriented EA and based on Zachman framework. Moreover, using service oriented architecture and cloud computing that are considered in this method, two tools have high flexibility totally, Proposed method via Proposing practical way to implement EA in cloud environment by using service oriented architecture and Proposing documents compromising increase modifiability

2-4- Using Proposed mapping

"EA is a complete definition of organization and a set of descriptive presentation of models in order to explain an organization the way can Adapt to generated management needs and is sustainable in its lifetime" [8]

According to above definition, documentation is considered as a fundamental section of modeling each activity such as EA architecture can be recorded in various levels of details in business architecture, data architecture, application and technological architecture.

As a having documents compromising relevant EA is one of important point of every EA.

Proposed mapping in this study are corresponding to Cloud computing, service-oriented architecture and based on Zachman Framework in technology architecture layer.

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Proposed mapping increases documents' quality (a set of parameters modifiability or maintainability), for example accuracy, completion, and readability documents (that is sub parameters of documents' quality) for implementation a given model.

Proposed documents (mapping) are as follows:

service oriented Enterprise Architecture n (SOEA n)	**Service oriented Enterprise Architecture..**	**service oriented Enterprise Architecture1 (SOEA 1)**	
If have relation between cloud service1 by SOEA n then mark this	…	If have relation between cloud service1 by SOEA1 then mark this cell	**Cloud computing services1**
"	"	"	**Cloud computing services..**
"	"	"	**Cloud computing services n**

Figure 1: Mapping of cloud services to service oriented EA

Aspects of Zachman Framework EA (people, data, motivation, place, process and time)			
If have relation between cloud service1 by aspects of Zachman Framework EA then mark this cell	"	"	**Cloud computing services1**
"	"		**Cloud computing services..**
			Cloud computing services n

Figure 2 : Mapping Cloud computing services to aspects of Zachman Framework

These mappings in addition to show a general view of communication between cloud-services to EA aspects and services of service-oriented architecture, over time needing to changes and finding change cases and its effect on other cases will be easier.

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Store Managers and	Accountants	Marketing sales manager	Repository staff	IT staff	Office staff	manager	
		√	√	√		√	Repository application service
	√			√		√	Accounting application service
√		√		√	√	√	order application service
				√			Sql server database service
				√			Processing infrastructure
				√			Storage Infrastructure
				√			network infrastructure

Figure 3 : Example of cloud mapping services to the people of Zachman framework

3-Proposed method

Due to limitations in using public cloud tools, this algorithm has been designed for private cloud. In this algorithm, it is assumed that private cloud has been constituted in organization (because making private, cloud should not been in the framework of this method. making and supporting is in charge or cloud supporting group). After done studies, this result has been taken that every cloud is a set of services. (Even if this service is only infrastructure).

EA group designing and implementing receives a list of executable in private cloud. And if required, the service at the present is to ask to cloud supporting group (This group is in charge of providing relevant service in cloud). Cloud supporting group makes requesting service and the list of present services has updated by showing the name and characteristics of relevant service.

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The activity of EA group is as follows:

1- Implementation of EA in the service-oriented manner and extracting service of SOEA and EA aspects in Zachman framework.

The output resulting from this stage that is required for next stages is as follows:

•A list of SOEA services

•A list of EA aspects in Zachman framework (columns of Zachman framework)

2- In this stage it is controlled that if EA services are available in the list of private cloud services or it is extra from a set of private cloud services.

3-If service is accessible or a set of services is extractable

The following stages should be done:

- List of private cloud services is given to EA services, for every EA service as an output

•Mapping private cloud services to EA is completed

•Mapping private cloud services to EA aspects (using a list of EA aspects of Zachman framework) is completed.

4-As service is unavailable, the request should be sent to make cloud service.

Support group makes cloud request service in private cloud and updates present services in cloud; moreover, it shows the features of each service.

5-At the end of each stage, algorithm control that if all EA services have been covered or not?

If all services have been covered, algorithm will finish.

Otherwise, it refers to EA services and algorithm has been executed for other EA services.

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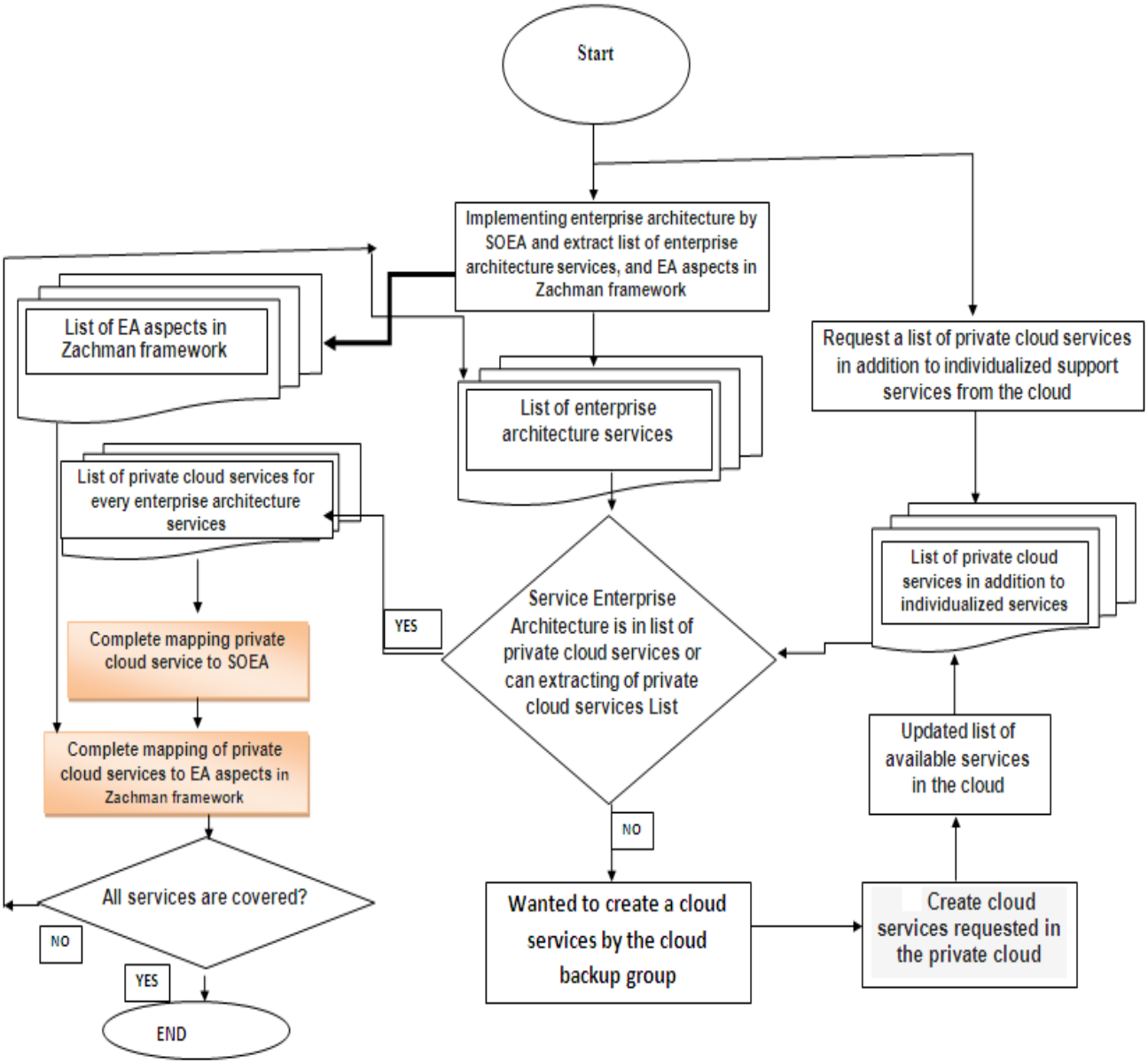

Figure 3: Algorithm Implementation enterprise architecture in cloud computing

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4-Discussion

In similar work different criteria exist for measuring modifiability. As a result, for evaluating completely all relevant criteria and using AHP method have been considered. This method solves complexities resulting from different factors on problem by focus on step by step in the factors and then combining the results of those studies. In fact, AHP changes a multidimensional problem to unidirectional and compares complicated decisions and understandable. In evaluation of suggested method, it is attempted to prove following hypothesis: using Proposed method to increase modifiability in implementing EA.

According to aim, evaluation criteria and selective options, analysis hierarchy tree are displayed.

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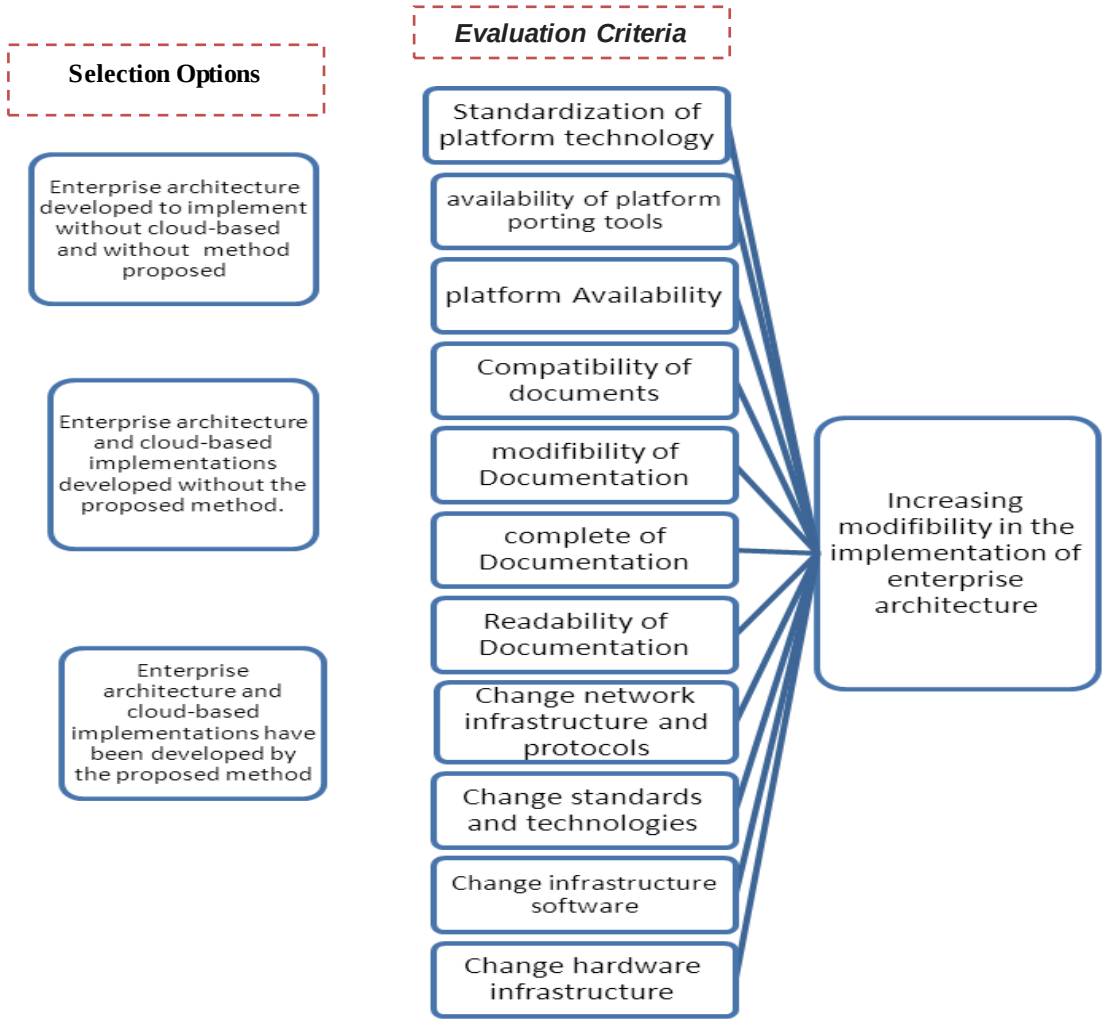

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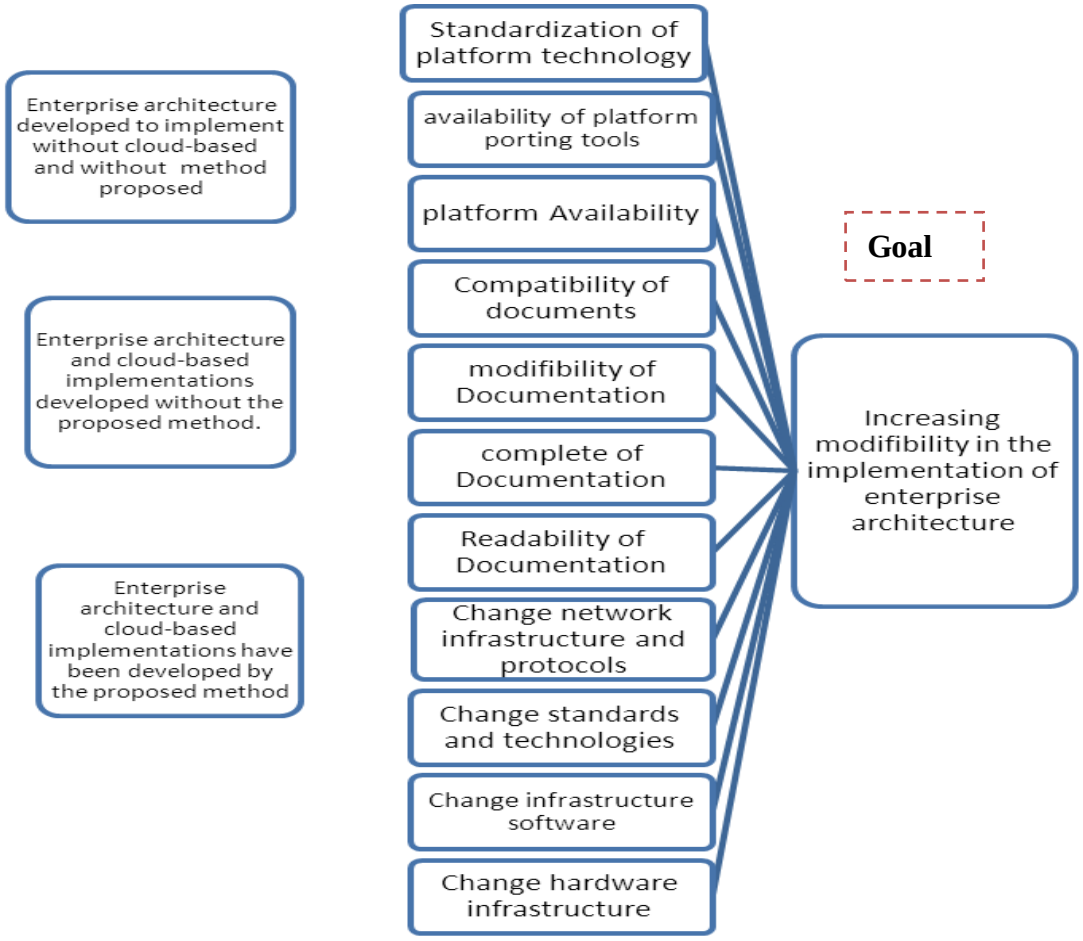

Figure 4: Analysis hierarchy tree (AHP)of current issues

After making analysis hierarchy tree, comparison matrix of modifiability criteria and suggestive options has been distributed by single criteria of modifiability in the form of evaluation between experts.

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Table1: Results of compared proposed method with other methods of EA implementation

Expert5	Expert4	Expert3	Expert2	Expert 1	
0.119	0.126	0.091	0.091	0.078	Enterprise architecture implementations without cloud-based and without method proposed
0.231	0.339	0.223	0.237	0.176	Enterprise architecture implementations with cloud-based and without the proposed method.
0.650	0.535	0.687	0.673	0.746	Enterprise architecture implementations with cloud-based and with the proposed method

The results of software expert choice 2000 is obtained and analyzed. The results were analyzed by the software Expert Choice 2000 and the results are described below. results has been explained Analysis of expert's ideas is an evidence of using cloud computing for implementing EA even if Proposed method in this study does not lead to increase modifiability , but using Proposed method of modifiability increases For instance, in expert' ideas using cloud computing reaches the scale from 0.078 to 0.176 (level is duplicate 2.2) and concurrent use of cloud computing and Proposed method reaches from 0.176 to 0.746(4.2 times than previous state and 9.5 easier form). As a result, using cloud and Proposed method increases considerably modifiability.

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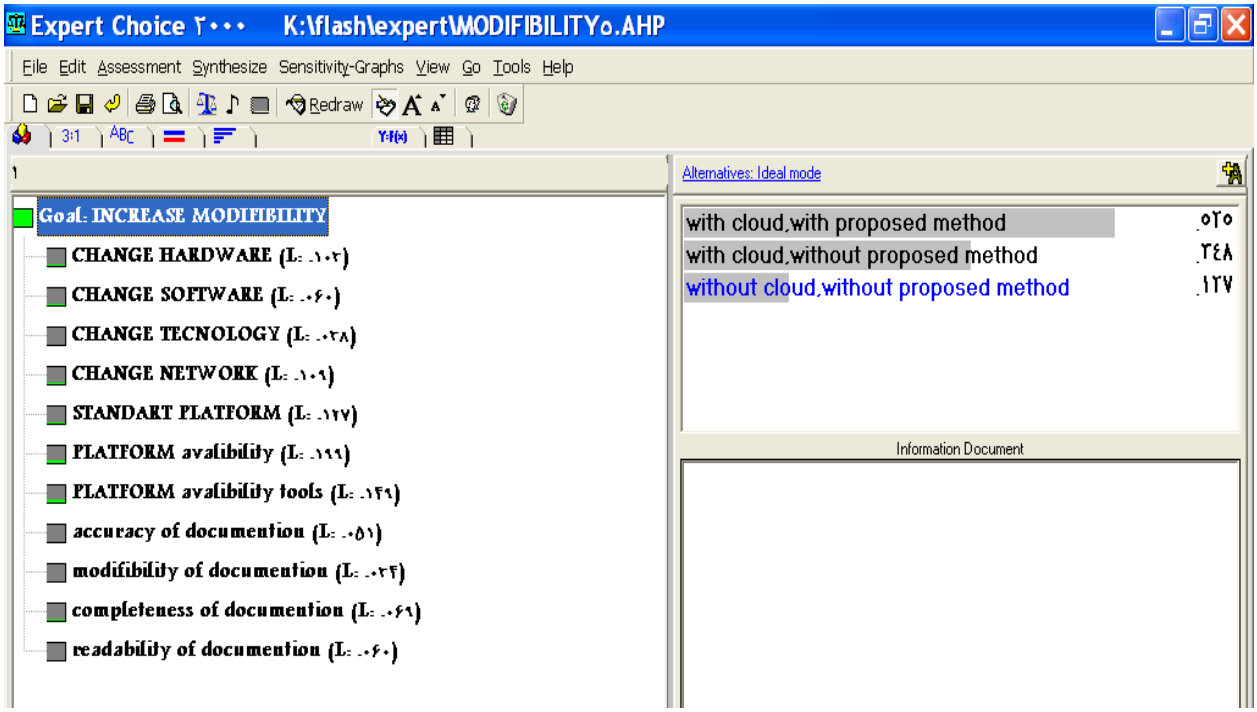

Figure 5: Sample Analysis Comparing of implementation methods EA by Software expert choice 2000

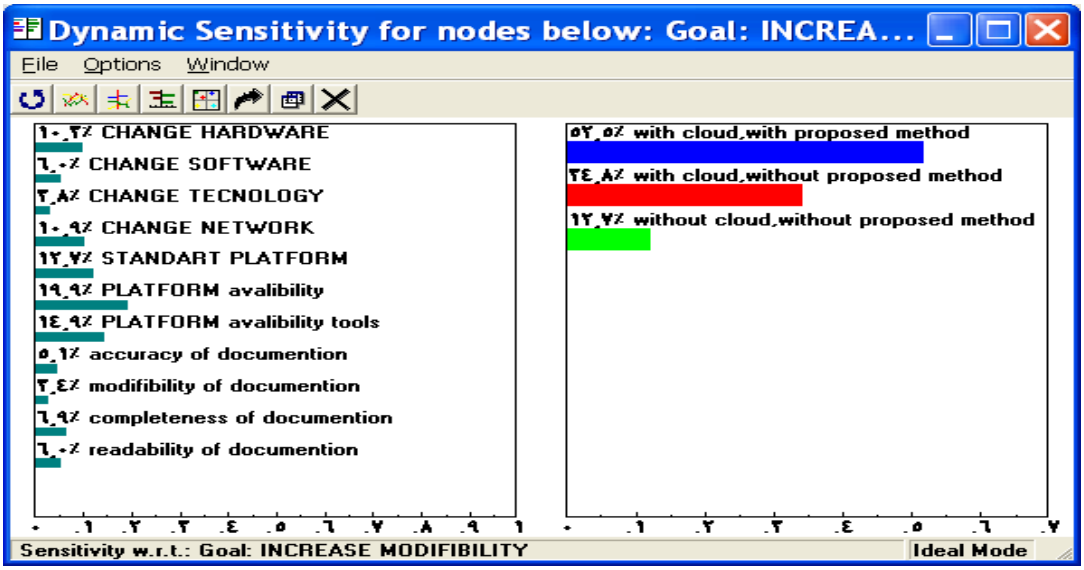

Figure 6: Sample Analysis Comparing of implementation methods EA by Software expert choice 2000

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Conclusion

While it is observed, Proposed methods including one algorithm and two mapping that are two basic activities to increase modifiability.

1-Proposed algorithm , implementing EA are indicated by service-oriented architecture and cloud computing in the term of practical solution (Regarding performed studies , similar solutions are not observed.

2-Having documents that are compatible with relevant EA is of main point of each EA. Proposed mappings in this work is a document that is compatible with cloud computing, service-oriented EA and based on Zachman framework. These mappings lead to increase the quality of support documents of EA. Proposed mappings of documents (That are maintainability and modifiability parameters) increase and refer to sub parameters documents' quality such as compatibility of documents, completion of them and eligibility. In addition to use service oriented architecture and cloud computing in this solution, two tools have high flexibility. Service oriented architecture adds to EA and extending charges are prohibited. Also , cloud computing is a solution for implementation of EA that has flexibility and high modifiability

Totally, Proposed solution via presenting practical method leads to increase implementation of EA in cloud environment log using service oriented architecture and indication compatible documents with this solution. The analysis of expert' ideas show this issue that using cloud computing for implementing EA even though Proposed method and modifiability are not used in this work as well. It leads to increase the modifiability but, application of Proposed method enhances the modifiability significantly

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