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Presenting a Native Model of Development the G-NAF Project in Iran

Kaveh Dolati[a], Dr. Mahmod Alborzi[b]*, Dr. Asghar Sarafi Zadeh[c]

[a]*Department of Management, Science and Research Branch, Islamic Azad university, 1nd Floor, No. 110, Mosavi Ave, Resalat St,Tehran, 1634663551, Iran*

[b]*Department of Industrial Management, Science and Research Branch, Islamic Azad University, Tehran, Iran*

[C]*Department of Management, Central Tehran Branch, Islamic Azad University, Tehran, Iran*

[a]*Email: kaveh.dolati@Gmail.com,* [b]*Email: mahmood_alborzi@Yahoo.com,* [c]*Email: sarafizadeh@Gmail.com*

Abstract

Having access to an exclusive and standard geo-referenced address will improve the quality of urban services in economic, social, environmental terms and etc. In this regard, Australia has always been one of the pioneers of G-NAF project. Hence in this thesis, after recognizing G-NAF in Australia and other Implemented successful cases, I investigated the present situation of addressing the premises in Iran; then, based on available documents and G-NAF expert opinions, required primary components to implement the project were extracted. Also along with this suggestion, Primary components of enterprise architecture, compatible with different organizational architecture designs, were extracted and then each of them were presented as a Likert scale questionnaire. In the next step, questionnaire was presented to Delphi panel elites. At the end, final components of the implementation project and also enterprise architecture components were extracted. Next, I use QFD method, including the implementation project and enterprise architecture matrix components, to verify coverage of this two elements. By using QFD method, it was proved that the enterprise architecture components covered all the required components for project implementation. Then the importance and priority of final components were determined, and ultimately, the proposed model and its implementation method were submitted.

Keywords: G-NAF; Geo Reference; Enterprise Architecture; QFD Method; Requirements of Executing the Scheme; Standard Address.

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* Corresponding author.

1. Introduction

Nowadays, with the rapid development of communications and information technology, especially the Internet, Geographical Information System (GIS) is of great use in urban and e-business management. Therefore, more attention should be paid to technologies related to GIS and its services, and the close interaction between GIS and Information Technology (IT).

The potential of Geospatial information for organizing the information in the form of integrated databases and location-based services is one of the issues of the scientific community in many industrial countries. In this regard, access to a unique, standardized address with the reference point is also one of the main demands of today's societies, in particular, the urban services provider organizations such as Post, Municipalities and so on. Having access to such an address not only can enhance the economic, social and environmental efficiency of urban management and services, but also it can improve traffic and transportation management (intelligent city), crisis management and emergency services, land management and Cadaster, urban infrastructure (water, gas, electricity and telecommunications) subscriber management, mail management and etc. as well.

The lack of the Geocoded National Address File (G-NAF) addressing system causes problems like:

- Low accuracy in maps used in routing intelligent systems
- Confusion about addressing method due to the huge volume and variety of address information in the country (Iran)
- Different standards in addressing methods and lack of national standards
- Various method for writing the names components of the address (street, alley, St., al. ...)
- Lack of inter-organizational coordination throughout Iran in addressing the location
- Different versions of zoning and division in urban maps
- Existence of alias and common addresses instead of official and standard ones
- Variety of resources in defining and determination of addresses
- Uncertainty in the names and indicators of address components
- High maintenance and constant updating costs for addressing databases in service provider organizations
- Inconsistency between the relevant organizations during incidents
- Inaccuracies in land and property documents of the country (Iran) in terms of area
- Increase in the cost of customer and citizen services for organizations, companies and entities

Australia has always been one of the pioneers of designing standard addresses [6] and reference points (called G-NAF) and has succeeded in developing and implementing a system for creating, maintaining and updating a national address book for both in-use and the Australian official addresses. As a result, Australia has an official and trusted database and address book [9].

The G-NAF plan has not yet been operationally implemented in Iran, however, according to paragraph 7 of Article 21 of the third chapter of resolutions of the Iran’s High Council of Information Technology, signed on

Sep 2nd, 2014, all related organizations (including Municipalities and Registry Offices) are required to cooperate with the project executer (Iran-Post) and the initialization operation must carry out immediately. This study is, therefore, aiming to achieve a total understanding of the Australian G-NAF project and propose a native model for implementation and execution with an organization architecture approach in the executer organization which covers the fundamental requirements of the projects considering the fact that the design, development and implementation of the National System of Standard Addressing project in Iran by the executer organization requires a great deal of investigations about implementation and execution. The purposeful and correct implementation of this project, so that it achieves all set goals, requires for the executer organization to use architectural frameworks. Organization architecture aims to create an organization that is capable of generating value for its current and future customers continuously and continuously and have the maximize return on resources. Therefore, lack of such frameworks in an organization causes the following problems:

- Absence (lack of recognition) of a strategy for execution
- Negligence about the actual requirements of the project execution
- Unreasonable timing of project execution
- Unreasonable cost of project execution
- High inertia and costly and slow development
- Stakeholders' dissatisfaction
- High complexity of project execution and of the organization

2. Research Background

2.1. Research Background: G-NAF Projects

G-NAF stands for Geocoded National Address File, which was first introduced in 1995 in Australia. Fifteen and provided key and official public institution and organization, including Provincial Lands and Deeds Registry Office, Australian Post Office, Central Government Information, Provincial Mapping Offices, Municipalities, Statistics and Information Center, Association and Commission of Australian Elections and etc. participated in developing this standard [10]. During the 1980s, significant investments were made in changing cadastral and topographic analog maps to digital in Australia. All organizations involved with the maps contributed significantly to preparation and digitization of analog maps and opened new doors of a technological revolution in the management of Geospatial information and improvement of its effectiveness in all sections of the country [10]. One of these organizations was the Australian Bureau of Statistics, in which, by the end of the 1980s, the population and housing census were conducted every 5 years with the traditional and paper-based methods. In the late 80's, the innovative idea of some elite surveyors using digital mapping techniques was a ray of hope for the directors of Australian Bureau of Statistics. The first meeting of the Society of Senior Surveyors was held in Canberra On January 31, 1992. The meeting addressed the possibility of creating a database for the national topographic and cadaster data [11]. Earlier in the same session, security-related institutional considerations were also debated and it was agreed that:

- The government should focus on the customer group.

- A consortium should be established through joint agreements.
- The Consortium should rely on private sector participation.
- Each state should have a separate mechanism.
- An independent secretariat should be established to ensure coordination.
- Members should establish a mechanism for assessing the consistency of institutional and organizational data.
- Each state should form a separate technical committee for this project.
- The ownership of each organization's data should be identified in order to determine the contribution and imposed costs.

These decisions became the basis for initiation of a forward movement in a multi-faceted interplay in the creation, progression and commitment to national Geospatial data set requirements in this country. In the first months, several meetings were held and many correspondence was exchanged before the PSMA General Survey Authority of Australia submitted its requirements for the 1996 census using digital maps to the Australian Bureau of Statistics on May 1st, 1992, leading to the publication of bids, by the Australian Bureau of Statistics [10, 11]. These needs should provide three separate services:

1. Providing required maps for all purposes (preferably generated from digital geospatial data)
2. Providing digital geospatial data (including statistical boundaries and baseline map features) for presenting and analyzing the census and other information from the Bureau of Statistics (both in digital and printed formats)
3. Creating a system whereby statistical data can be updated.

The provision of these services was important for the following reasons:

- There were about 33,000 information gathering areas for the 1996 census.
- The information gathering areas should have covered the entire Australian territory and had no gaps or overlap between their boundaries.
- The boundaries of information gathering areas should have covered millions of kilometers nationwide as a linear feature.
- Ranges of the data collected by a unique identifier should have been are distinguished from one another on printed maps, geospatial data and records of the database.

In July 1992, a consortium was established by the ministers of roads and urbanism to take over political and supportive leverage in Darwin, Australia. The consortium selected a legal firm to prepare the draft f an agreement between the Agency, the New South Wales government, and the Australian Bureau of Statistics. The Information Supply Agreement for the Australian Bureau of Statistics was eventually signed on June 8th. Much extensive activity in this period led to proof of concept, validation of data and cost and project specifications estimation. A few days before the New Year's Eve, the Australian Bureau of Statistics approved PSMA to be the main supplier of mapping information and geospatial data in Australia [10, 11]. Therefore, Australian PSMA received a budget to conduct a wide range of activities to provide required facilities and services. The

agreement also authorized PSMA to monetize through the products produced in this project on a retailing scale [10, 11]. Ownership and protection of people's information and the quality and availability of various information were among the priorities of this project. Each field also had the responsibility to fund preparation and standardization of its information. PSMA was selected as the geospatial data driven force in order to synchronize data, creating new geospatial datasets and facilitating access to the infrastructure of the national geospatial data. PSMA Ltd. Was registered in June 2001. Subsequently, list of partners, goals, organizational management and architecture and implementation model were identified. Finally, the above mentioned national dataset was named Cadlite. The dataset was entirely produced by the private sector and in partnership with PSMA. Moreover, another service called the Geocoded National Address File, or G-NAF, was produced which was significantly essential and important for Australia [6, 10, 11]. PSMA allows the investigation, matching and clearing of data in any organization internally and without payment to its stakeholders under an agreement. PMSA also has the right to sell data and services based on permissions of the board of directors [10, 11].

This company has produced 6 geospatial data products so far which include:

1. The Australia's Geocoded National Address File, G-NAF, with over 13,179,509 records
2. The borders of Australia, from the electoral boundaries to the urban suburbs
3. The Dataset of 10.5 million Australian real estate units, including suburban names
4. Places of cultural significance, including schools, hospitals, and ...
5. Central road-lines, passages' network, railway stations, air infrastructure and parks
6. Surface and Spot Postal Code dataset

2.2. Research background: Global Organization architecture

Based on research carried out from various sources, the following results can be obtained [1, 4, 5, 12]:

- The first paper by Zachman, 1987.
- The Technical Architecture Framework for Information Management (TAFIM) issued by the US Department of Defense, 1992
- The "Clinger-Cohen" act passed by the US Congress, 1996
- TAFIM Retired, 1998
- Federal Enterprise Architecture Framework (FEAF) issued by the US government, 1999.
- Federal Enterprise Architecture (FEA) replaced FEAF by the US government, 2002.
- The Open Group Architecture Framework (TOGAF) issued, 2003.
- The Gartner model proposed, 2005.

2.3. Research Background: Organization architecture in Iran

- Establishment of the Technical Information Architecture Committee under the Secretariat of the Supreme Council for Communication in 2003 [3].

- Drafting the National Framework of Organization architecture in 2005 [3].
- Establishment of a service-oriented organization architecture laboratory sponsored by the IT organization in 2011[3].
- Establishment of the National Committee of Organization Architecture with participation of government representatives, private sector and universities in 2015 [3].
- Launching the project for establishment of branches of the Service-Oriented Organization Architecture Laboratory throughout the country (Iran) in 2015 [3].
- Initiation of the project of developing the Organization Architecture National Framework and National Program in 2015 [3].

2.4. Research Background: Organization Architecture by the Project Executer (Post)

No serious and effective research has been conducted in the past by the project executer organization.

2.5. Research constraints

- Restricted access to experts familiar with both G-NAF and enterprise architecture projects.
- Lack of operational experience regarding the G-NAF project in Iran.
- Inadequacy of knowledge and experience regarding implementation of enterprise architecture project at Iran post company.
- Lack of proper adaptation between the institutional indicators in Australia and Iran.

3 . Research Methodology

Considering that the use of each research method is varied depending on the nature of the environment and the field of research, the activities necessary for reaching conclusion and the extent of recognized responsibility about the results and goals, this research uses information gathering tools such as expert guidance, expert interviews, observation, questionnaire surveys, and examination and analysis of documents. Therefore, we first studied the G-NAF project in Australia and then examined the current status of address registration and addressing places and venues in the executer organization (Iran-Post) and the related organizations. The primary components of execution requirements were then proposed to the Panel of Delphi Experts considering the documents, views of managers and experts of the G-NAF field. The main components of organization architecture for the executer organization were also proposed to the Panel of Delphi Experts as questionnaire based on studies about the different patterns of organization architecture and proportionate to requirement components [8]. After finalizing the indices and components of these two domains, the next step we asked the opinions of managers, experts and specialists of both G-NAF and organization architecture domains about the significance and sequences of each component of the execution requirements of the project and organization architecture. The corresponding information were gathered, analyzed by QFD matrix method and the coverage of all the final components of the requirements was examined and approved by the organization architecture components. Finally, the proposed model and the project execution method was presented with an organization architecture approach to the executer organization. The research methodology is shown in Figure 1

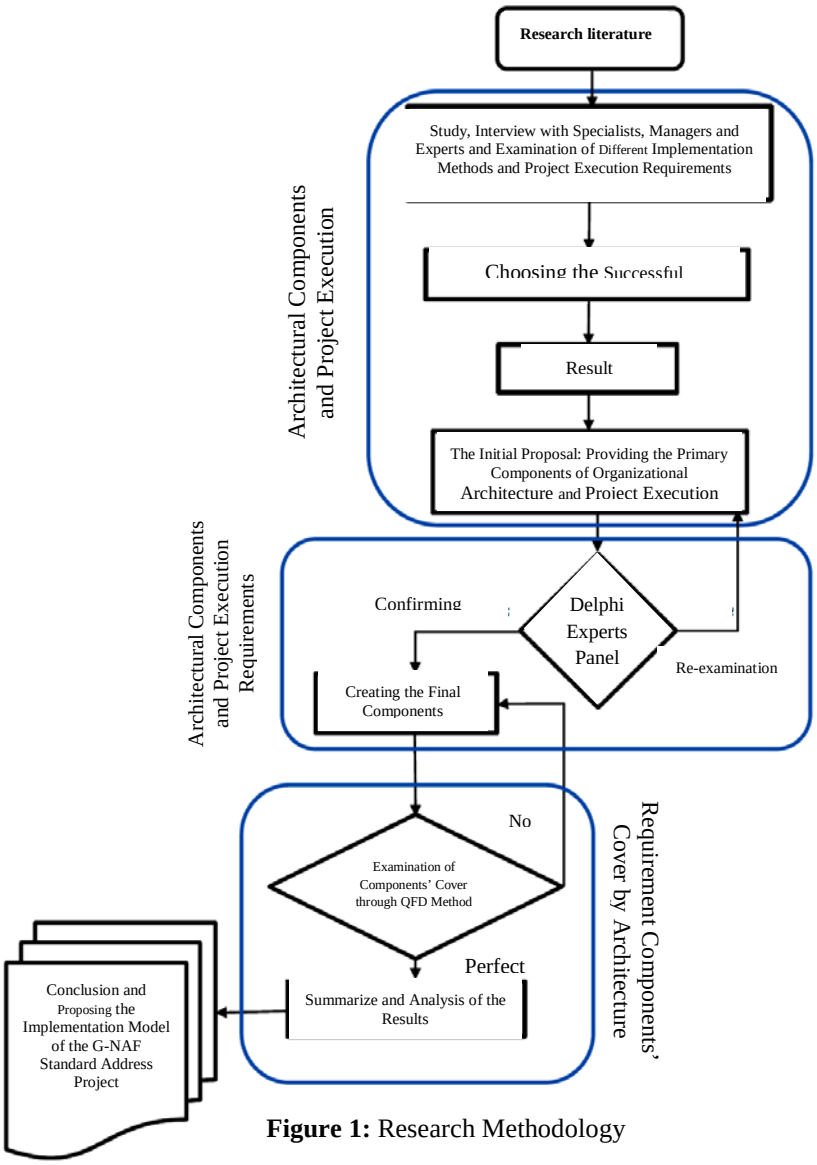

Figure 1: Research Methodology

4. Research findings

Considering Iran's limited theoretical and practical experience in the field of organization architecture, understanding and benchmarking the credible and successful organization architecture experiences and solutions in the world is one of the inevitable necessities of each organization for adopting a pattern and an appropriate method for designing. On the other hand, it should be noted that the mere selection of one of the existing frameworks and methodologies of the organization architecture will limit us to arid formats which sometimes aren't suitable for the conditions and requirements of the executer organization (Iran-Post). This may result in the reduction of effectiveness and efficiency of the project. Therefore, the appropriate strategy for providing a suitable framework and model for project execution is to study frameworks and common architectural processes in successful countries and get inspiration for designing the project pattern based on its desired parameters and criteria.

4.1. Proposing the Primary Components of Organization Architecture Frameworks and Project Execution Requirements

Table 1: Summary of Organizational Architecture Frameworks

No.	Main Components	Corresponding Organizational Architecture framework
1	**Planning**	**TOGAF framework:** Principles and Premises
2	**Identification of Organizational Strategies**	**FEAF framework**: Architectural Propulsion and Strategic Orientation
		TOGAF framework: Mission and Vision
3	**Comparative Study**	**National Organization Architecture**: Comparative Study
4	**Identification of the As-IS Architecture**	**Zachman:** First level: Setting business goals
		Zachman: Second level: Business modeling
		FEAF: The As-IS architecture
		C4ISR framework: Operational layer and System layer
		National Organization Architecture: The As-IS architecture
5	**Development of Information Technology Strategy**	**National Organization Architecture**: The results of strategic planning and information technology
6	**Providing the To-BE Status Architecture Model**	**Zachman:** Third level: Application modeling
		Zachman: Forth level: Selection and proposing the rational model
		C4ISR framework: System layer and Technical layer
		TOGAF framework: System architecture and Technology architecture
		FEAF: To-BE architecture, Architecture sections, Architecture models and standards
		National Organization Architecture: To-BE architecture, E-government, Standards and Proposals
7	**Development of Transition Plan**	**Zachman:** Forth level: Selection and proposing the rational model
		Zachman: Fifth level: Production and proposing the physical model
		FEAF: Transitional Processes
		TOGAF: Opportunities and strategies, Transition planning
		National Organization Architecture: Transition plan
8	**Update, Maintenance and Executing the Project**	**Zachman**: Sixth level: Using organization (operational model)
		TOGAF: Steering and monitoring change and change management
		National Organization Architecture: Organization architecture maintenance system

In the first stage, the following 8 components are concluded from study and analysis of the frameworks of five different models of organization architecture (table 1).

The combination of different layers of various types of organization architecture and the above frameworks result in the proposed Table 2. Moreover, considering the field studies, interviews with managers and experts and examination of the project execution documents in other countries, especially Australia, the components of execution requirements are proposed to the Delphi Experts Panel in the form of Table 3:

Table 2: Primary components of organizational architecture

No	Components of Organizational Architecture of the Project
1	Planning
2	Identification Organizational Strategies
3	Identification of the As-IS Business Architecture
4	Identification of the As-IS Data Architecture
5	Identification of the As-IS Application Architecture
6	Identification of the As-IS Infrastructure Architecture
7	Comparative Study
8	Developing the Information Technology Strategy
9	Providing the To-BE Business Architecture Model
10	Providing the To-BE Data Architecture Model
11	Providing the To-BE Application Architecture Model
12	Providing the To-BE Infrastructure Architecture Model
13	Developing the Transition Plan
14	Project Maintenance and Update

4.2. Selection of Final Components of the Project by Delphi Method:

In this step, the significance of each component is asked from experts and specialists of both G-NAF and organization architecture fields through questionnaires. To this end, an experts panel is formed with a specific range of experts (specialists of organization architecture and G-NAF) which consists of twelve people. The

questionnaires are then sent to them. Identification of experts is an important point in the Delphi approach because achieving the goals depends on the precise selection of participants. Delphi focuses on extracting comments from experts in a short period of time. The results depend on the expertise of individuals in the knowledge of the subject, the quality and accuracy of responses, and their collaboration and consistence involvement in the study period. Delphi expert needs to have enough knowledge in the subject matter (*HP. Kennedy,2004)*. The composition of a Delphi Panel is described in Table 4.

Table 3: Primary component of execution requirement

Components and Requirements for Execution of GNAF Standard Address in the Executing Organization	
Technical	1. The need for Geo-coding and standardization of all Iranian addresses
	2. Reinforcement of the As-IS IT infrastructure of the organization
	3. The Application of professional software for Geo-coding the addresses
Implementation	4. Interactivity and inter/intra organizational collaboration
	5. Intra organizational interactivity
	6. Using reference models
Planning	7. Extent and dispersion of project execution in the entire country
	8. Optimization of Implementation, maintenance and training costs
	9. Training and recruitment of expert human resources in the organization
	10. Execution in planned time
	11. Creating job opportunities and facilitating business
	12. Service to stakeholders of the organization

The information is gathered by questionnaire. These are closed questionnaires and the experts and specialists comment on specific criteria and indicators in order for the definitive indicators to be identified. Each respondent will be questioned by several variables in accordance with each questionnaire. The questions of this questionnaires are prepared in several sections including components of project organization architecture, components of technical necessities and requirements and project planning and implementation. The questions are plotted based on the Likert spectrum. The responses are first gathered qualitatively and then are converted to

quantitative figures. The Likert spectrum is described in Table 5.

Table 4: The combination of Delphi panel

Member	Educational Degree	Area of Expertise	Number
University Professor	PhD	IT	2
	PhD	Organizational Architecture	3
Organizational Architecture Expert	Master	Organizational Architecture	1
G-NAF Expert	Master	G-NAF	4
	Bachelor	G-NAF	2
		Total	12

Table 5: Likert Spectnm

Option	Strongly Disagreed	Somewhat Disagreed	No Comment	Somewhat Agreed	Strongly Agreed
Spectrum	1	2	3	4	5

It should be noted that the design of the questionnaire is based on the existence of model components and their arrangement. The architecture questionnaire consists of 14 components and project execution requirements questionnaire consists of 12 components. In the final stage (analysis of the results and presenting the proposal) we need another round of interviews to ask the opinions of managers, experts and specialists. This would be a semi-structured interview.

4.3. Summary of the Results of the First and Second Rounds of the Panel

After holding two rounds of the Delphi panel, calculating the size, the mean, the mode, and the standard deviation we studied and analyzed the gathered information. The means of components which were less than 4 in the Likert spectrum in both architecture and requirement indicators were omitted in order to increase the convergence of responses and the extent of the respondents' agreement. Therefore, the number of architectural

components decreased to 11, and the number of requirements components were reduced to 9. Accordingly, the significance, mean, and the standard deviation of the final components of the organization architecture and the project execution requirements are determined according to Tables 6 and 7. Eventually, the Kendall W's agreement is calculated. We entered all components of both architectural and requirement indexes into the SPSS software and calculated the correlation coefficient of Kendall's tau_b. In average, the coefficient for the first round of the architecture was calculated to be around 0.44 and for requirement components was calculated to be 0.52. Considering the low population of the statistical community (the Delphi Panel), this much agreement was enough for the panel to stop.

Table 6: The summary of the results of architecture components

		Round 1			Round 2		
No.	Organizational Architecture Components	Mean 1	SD 1	Significance (%)	Mean 2	SD 2	Significance (%)
1	Planning	4.50	0.67	90.00	4.75	0.45	95.00
2	Identification of Organizational Strategies	4.67	0.49	93.33	4.83	0.39	96.67
3	Identification of the As-IS Business Architecture	4.00	0.60	80.00	4.17	0.58	83.33
4	Identification of the As-IS Data Architecture	3.92	0.79	78.33	4.00	0.60	80.00
5	Identification of the As-IS Application Architecture	3.50	1.24	70.00	3.50	1.17	70.00
6	Identification of the As-IS Infrastructure Architecture	4.00	0.95	80.00	3.92	0.79	78.33
7	Comparative Study	4.08	0.90	81.67	4.00	0.60	80.00
8	Development of the Information Technology Strategy	3.83	1.19	76.67	3.92	1.16	78.33
9	Providing the To-BE Business Architecture Model	4.17	0.72	83.33	4.33	0.49	86.67
10	Providing the To-BE Data Architecture Model	4.00	0.60	80.00	4.00	0.43	80.00
11	Providing the To-BE Application Architecture Model	4.17	0.58	83.33	4.17	0.39	83.33
12	Providing the To-BE Infrastructure Architecture Model	4.00	0.95	80.00	4.00	0.74	80.00
13	Development of the Transition Plan	4.42	0.67	88.33	4.83	0.39	96.67
14	Project Maintenance and Update	4.08	0.90	81.67	4.42	0.51	88.33
Average		4.10	0.81	81.90	4.20	0.62	84.05

4.4. Examination of the Project Components' Coverage

In the third step, the significance of each of the final components is once again asked from the experts, managers and Delphi Panelists through questionnaires and the information is gathered. This information is eventually analyzed. Then, the coverage of the execution requirements components is examined by the project execution architecture using the QFD method.

The first step in the QFD method is the goal projection. Due to the similarity of the matrix to a house, it is called "House of Quality". Unlike its seemingly complex and confusing appearance, House of Quality contains very important and useful content which, apart from providing invaluable information about the product, it can be an ending point to many actual projects due to the breadth and variety of concepts extracted from it, if it is prepared accurately and appropriately. Hose of quality is a powerful tool which can simply be considered a matrix of “Whats” and “Hows” [7].

Table 7: The summary of the results of requirements components

No.		Components and Requirements for Execution of GNAF Standard Address in the Executing Organization	Round 1			Round 2		
			Mean 1	SD 1	Significance (%)	Mean 2	SD 2	Significance (%)
1	Technical	The need for Geo-coding and standardization of all Iranian addresses	4.92	0.29	98.33	4.92	0.29	98.33
2		Reinforcement of the Existing IT infrastructure of the Organization	4.50	0.52	90.00	4.75	0.62	95.00
3		Application of professional software	4.42	0.67	88.33	4.33	0.78	86.67
4	Implementation	Interactivity and inter-intra organizational collaboration	4.25	0.75	85.00	4.17	0.83	83.33
5		Intra organizational interactivity	4.08	0.67	81.67	3.92	0.67	78.33
6		Using reference models	3.83	0.58	76.67	3.92	0.51	78.33
7	Planning	Extent and dispersion of project execution in the entire country	4.17	0.72	83.33	4.42	0.51	88.33
8		Optimization of Implementation, maintenance and training costs	4.08	0.67	81.67	4.33	0.49	86.67
9		Training and recruitment of expert human resources in the organization	4.17	0.72	83.33	4.33	0.49	86.67
10		Execution in planned time	3.67	0.78	73.33	4.00	0.60	80.00
11		Creating job opportunities and facilitating business	3.50	1.00	70.00	3.50	0.80	70.00
12		Service to stakeholders of the organization	4.33	0.65	86.67	4.58	0.51	91.67
Average			4.16	0.67	83.19	4.26	0.59	85.28

Therefore, in order to determine the coverage of the execution requirements components by the organization architecture component, we first determine the impact of each organization architecture component (Hows) based on the requirements and demand of the project execution (Whats) through completing the relationship matrix of House of Quality.

It should be explained that, the Quality cells of the given QFD matrix is tailored to the views of experienced engineers, specialists and managers of the execute organization and it is put in Table 8 by the help of examination of statistical data.

Various sources illustrate the relationship between each requirement with technical characteristics using symbols and shapes. The weight of each one is used according to this Figure:

● : Strong Relationship (9)

○: Average Relationship (3)

△: Weak Relationship (1)

In front of and below each of the organization architecture components of the (Hows) there can be one of the three symbols: ●, ↑ or ↓. The symbols ↓ or ↑ mean that the designers of the final model were aiming for the increase or decrease in that quality. The ● shows that the designers of the model were not after increase of decrease of that quality from the related target value.

Table 8: The house of quality QFD matrix

Requirements for Executing G-NAF Project (WHATs) \ Organization Requirements and Architecture Components of the Project (HOWs)		Initial Planning	Identification of Strategies of the Executing Organization	Identification of the As-IS Business Architecture	Identification of the As-IS Data Architecture	Comparative Study	Proposing the To-BE Business Architecture Model	Proposing the To-BE Data Architecture Model	Proposing the To-BE Application Architecture Model	Proposing the To-BE Infrastructure Architecture Model	Development of the Transition Plan	Update, Maintenance and Execution	The Importance of Requirement Components (Delphi Expert Panel)
		●	↑	↑	↑	●	●	●	●	●	●	↑	
The Importance of Architecture Components (Delphi Expert Panel)		4.75	4.83	4.25	4.17	4.17	4.33	4.17	4.17	4.17	4.83	4.42	
Technical	Geo-coding and standardization of all Iranian addresses		●	○	●	○	○	●	○	○	●	●	4.92
	Reinforcement of the Existing IT infrastructure of the Organization					○			○	●			4.83
	Application of professional software for Geo-coding the addresses			○	○	○	○	△	●	●	●		4.50
Implementation	Interactivity and inter/intra organizational collaboration		○	●	●	○	●	●	●	○		○	4.33
	Extent and dispersion of project execution in the entire country		○	○	○	●	○		●	●	○	●	4.42
Planning	Optimization of Implementation, maintenance and training costs					○			○	△	●	●	4.33
	Training and recruitment of expert human resources in the organization	○	○	○					○		●	●	4.33
	Execution in planned time (approved by the Iran's High Council of Informatics)	●								△	●	●	4.17
	Service to stakeholders of the organization		○	○	△	○	●	●	●	○	△	●	4.58

Undoubtedly, obtaining correct and suitable results from the House of Quality requires accuracy and validity of the data entered in it. Therefore, based on the analysis conducted and according to Figure 2, all the components of the project execution requirements are covered by the organization architecture components and there are no

requirements components that is not met by the organization architecture components.

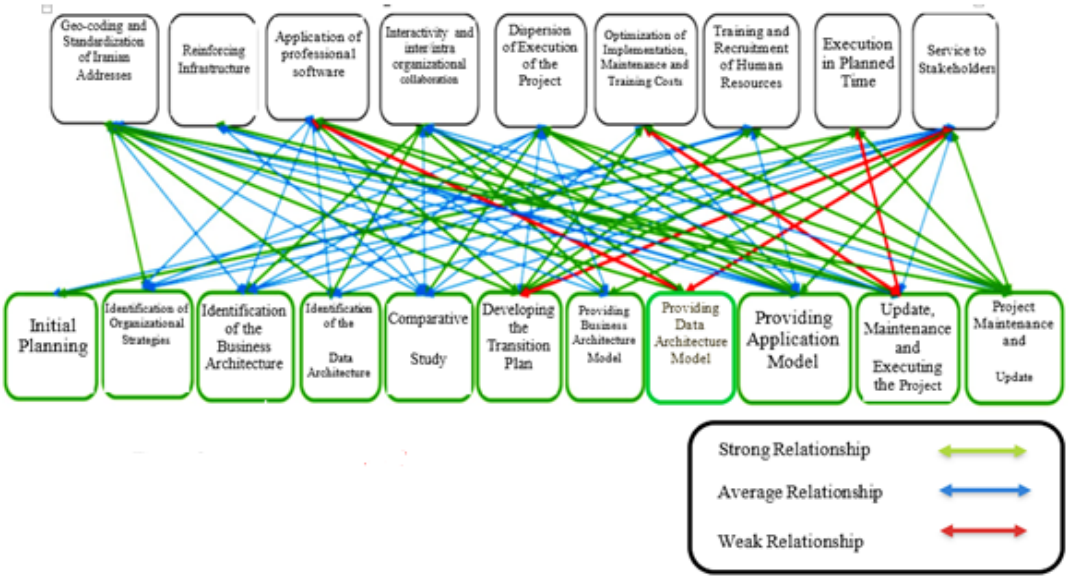

Figure 2: Coverage Illustration

4.5. Extraction of the Final QFD Matrix

To extract the priority and weights of each of the components we needed to evaluate the current status of the organization (the current progress of project execution) as well as determining the plan of the organization for each of the project execution components.

Once again the opinions experienced engineers, experts and managers of the organization were sought by distributing a questionnaire about the As-IS situation of the organization and the final target of each requirement component. The responses were evaluated according to a 5-option Likert spectrum (1 to 5).

Now, after completing the required data, the following steps will be taken in this order to analyze the collected data and determine the relative and absolute weights of each requirement and organization architecture components:

The rate of improvement and enhancement for each of the qualitative requirements of the requirement components (recovery ratio = B) is calculated by dividing the content of "organization plan" (P) column to “As-Is” (N).

After determining the recovery ratio values, each of the execution requirement components will be assigned a coefficient called the “Correction Factor” (Column C) in order to emphasize on some of the executive demands of the project.

This coefficient is determined by the comments of the senior managers of the project execution department in the executer organization.

For this purpose, the numbers corresponding to the "significance of each demand", "improvement ratio" and "correction factor" are multiplied. The result of this multiplication represents the significance and absolute weight of each given demand (need).

A * B * C = (Correction Factor) * (Improvement Ratio) * (Degree of Significance) = Weight of each demand (need) W1

Moreover, we can calculate the relative coefficient of significance for each demand component in order to relatively compare requirements in the last step.

To do so, the absolute weights of each requirement component (demand=W1) is divided to the total value of W1 column and the resulting number is multiplied by 100. The results are given in Table 11.

$$\frac{The\ Absolute\ Weight\ of\ Each\ Demand\ (w1)}{Total\ Absolute\ Weight} \times 100 = E1\ (The\ Relative\ Weight\ of\ Each\ Qualitative\ Demand)$$

In addition, the weight of each organization architecture component (Hows) is determined considering the relationship of that feature with project execution requirement (Whats).

If the relationship betwwen each execution requirement components (i) with one of the organization architecture components (j) is d_{ij} and W_i is the significance of each requirement component, then the absolute weight of each organization architecture component (W_j) is calculated from the following equation:

$$W_j = \sum_{i=1}^{n} W_i d_{ij}$$

i = 1, ..., n the project requirements components

j = 1, ..., m the organization architecture components

The relative weights of each organization architecture component to requirements components is calculated from the following equation:

$$\frac{The\ Absolute\ Weight\ of\ Each\ Architecture\ Feature\ (w2)}{Total\ Weights\ of\ features} = E2\ (The\ Relative\ Weight\ of\ Each\ Architecture\ Component)$$

The results are presented in Table 9.

Table 9: The final QFD matrix

	Organization Requirement and Architecture Components of the Project (HOWs) / Requirements for Executing G-NAF Project (WHATs)	Initial Planning	Identification of Strategies of the Executing Organization	Identification of the As-IS Business Architecture	Identification of the As-IS Data Architecture	Comparative Study	Proposing the To-BE Business Architecture Model	Proposing the To-BE Data Architecture Model	Proposing the To-BE Infrastructure Architecture Model	Proposing the Application Architecture Model	Developing the Transition Plan	Update, Maintenance and Execution	The Importance of Requirement Components (Experts)-A	Evaluation of the Organization (Experts)-N	Plan of the Organization (Organization Managers)-P	Optimization Ratio -B	Correction Factor - C	Weight: Absolute Weight of Each Demand (need)- W1	Weight: Relative Weight of Each Demand (need)- E1
	The Importance of Architecture Components (Experts)	4.75	4.83	4.25	4.17	4.17	4.33	4.17	4.17	4.17	4.83	4.42							
Technical	Geo-coding and standardization of all Iranian addresses		●	○	●	○	○	●	○	○	●	●	4.92	1.9	5	2.6	1.5	19.3	10.9%
	Reinforcement of the As-IS IT infrastructure of the organization					○			○	●			4.82	2.8	5	1.8	1.2	10.5	5.8%
	Application of professional software for Geo-coding the addresses			○	○	○	○	△	●	●	●		4.5	1.2	5	4.3	1.5	28.9	16.0%
Implementation	Interactivity and inter/intra organizational collaboration		○	●	●	○	●	●	●	○		○	4.33	2.8	4.5	1.6	1.5	10.3	5.7%
	Extent and dispersion of project execution in the entire country		○	○	○	●	○		●	●	○	●	4.42	1.2	5	4.3	1.2	22.7	12.6%
Planning	Optimization of Implementation, maintenance and training costs					○			○	△	●	●	4.33	1	4.5	4.5	1.2	23.4	12.9%
	Training and recruitment of expert human resources in the organization	○	○	○					○		●	●	4.33	1	5	5	1	21.7	12.0%
	Execution in planned time (approved by the Iran's High Council of Informatics)	●								△	●	●	4.17	1	4	4	1	16.7	9.2%
	Service to stakeholders of the organization		○	○	△	○	●	●	●	○	△	●	4.58	1	4	4	1.5	27.5	15.2%
Weight	**Absolute Weight of Each Technical Component (Architectural)- W2**	50.52	97.26	107.2	123.8	108	94	129	244.7	173.74	218.1	253.7	1600			**Total**		181	100%
	Relative Weight of Each Technical Component (Architectural)- E2	3.2%	6.1%	6.7%	7.2%	7.6%	7.6%	8.1%	13.3%	10.9%	13.6%	15.9%	100%						

5. Summarizing the QFD Matrix Results

- Comparison of significance, the current status and the plan of the organization about the project execution components along with Diagram 1 show that the As-Is quantitative value is equal to 1.54 or 30.75% in all components by average. The goal of the managers of the organization in the To-BE status is for all components to be 4.67 or 93.34% in average. This means the organization is 62.58% away from the desired status.
- By comparing the relative weight and significance of organization architecture components we can conclude that how important each component is in the execution and what percentage of the execution belongs to that component. For example, planning is about 11%, significant but it accounts for 3% of the total project.
- By comparing the relative weights and significance of the project execution requirement components we can find out how significant each component is for the demands and requirements of the project execution and they account for what percentage of the entire demand of the project. For example, reinforcement of IT infrastructures has the high significance of about 13% but accounts for about 6% of the total project requirement.

- Based on the results obtained for each of the organization architecture indicators and project execution requirements we can determine the priorities of each components, as well as its contribution.
- Moreover, based on the priorities obtained for the project execution requirements components we can see the execution components as a graphic scheme which, in fact, shows the contribution of each part in the execution of the project.

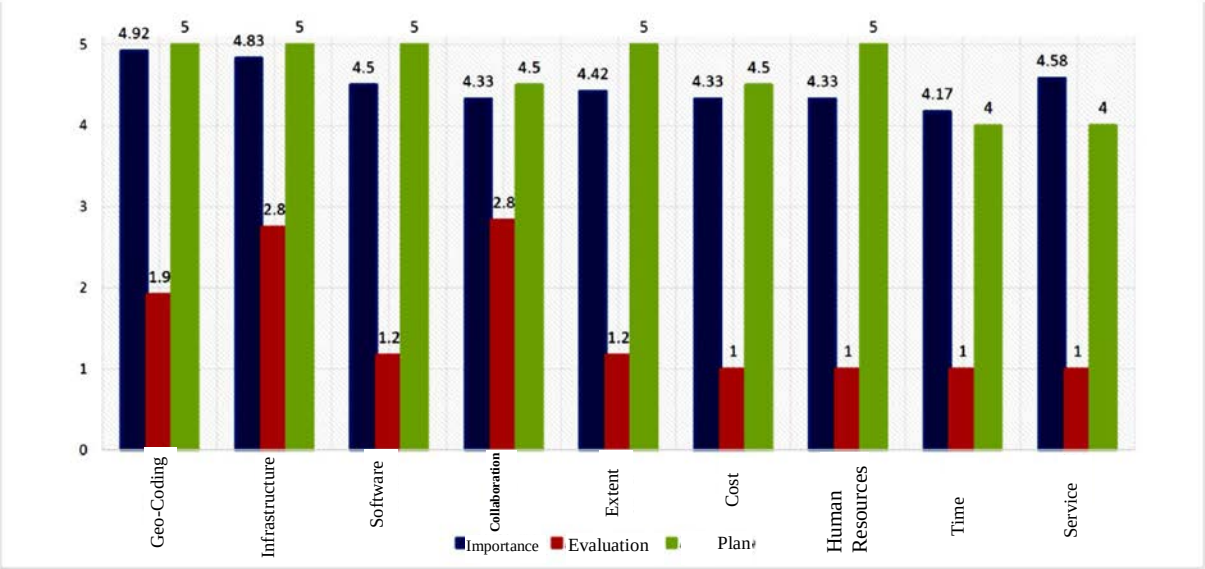

Figure 5: Comparing the Importance, the As-IS Status and Plan of the Organization for Requirements of Executing the Project

6. Conclusion

You can see the sequence of each project execution with the organization architecture approach in a graphic scheme. This is actually the G-NAF project execution model with native architectural approach is shown as the project execution cycle (Fig. 3).

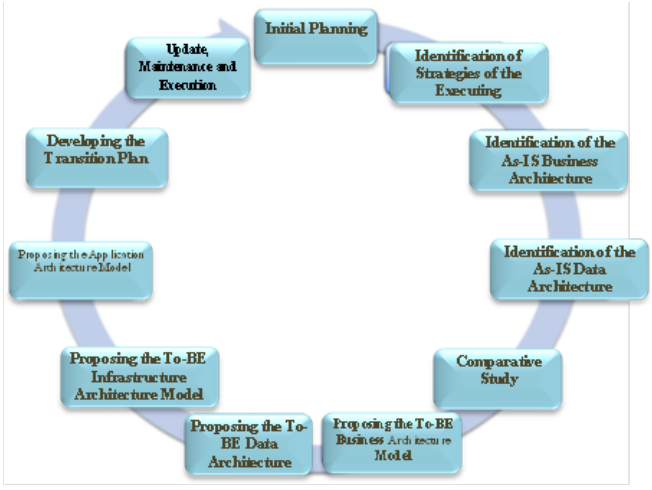

Figure 3: Executing Model for G-NAF Project with Organizational Architecture Approach

7. Recommendations

In the end, we recommend that considering the proposed model for executing the G-NAF project with organization architecture approach (see Figure 3), for the execution and implementation of this project to be done in five steps as the following process (Figure 4).

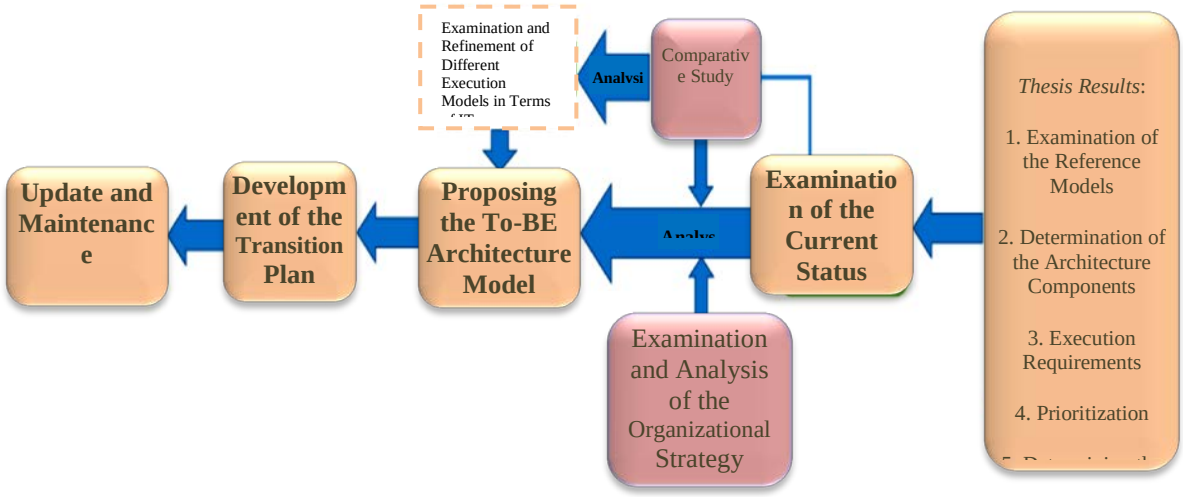

Figure 4: The Propose Process for Execution and Implementation of the Project

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