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RESEARCH ARTICLE

Analysis Dimensions of Policy Development of Advanced Information Systems (Smart), Management Strategy to Improve the Situation and Gain Competitive Advantage of Public Organizations by using Fuzzy Logic

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ABSTRACT

In recent years we have seen wonderful advances ininformation technology. Changes that have Significant impact on human life. Information technology has wide applications in various fields, One of the applications is advanced information systems (smart). It seems smart systems, able to simulate the behavior of intelligent. One of them featuring is that could think and actlike humans. Governments inmany countries, have Developed institutions and special programs in order to promote this technology. The main objective of this research is the identification dimensions of policy development of advanced information systems (smart) to improve the situation of public organizations by using fuzzy logic from the perspective of IT professionals in government agencies in the city of Zahedan. Inthisstudy,we used the Fuzzy AHP and fuzzy Delphi method to identify and rating of the options. The results confirmed 6 dimensions and 16 options and options way of formulating both specific and general policy, Indirect involvement of government, formation and entrepreneurship in the growth stage, policy support

infrastructure products and supporting the ICT field, followed or later development strategy, primary responsibility to Technology guiding by public sector havea higher preference to other options.

Key words: Information Technology, Intelligent systems, Policies, Fuzzy Delphi method, Fuzzy AHP method.

INTRODUCTION

In this age of information, almost all fields of endeavour such as education, manufacturing, research, games, entertainment, and business treat information systems as a need. Indeed, every activity in our daily life today requires people to get involved in the use of information systems (OECD, 2013). An information system (IS) is a computerized database designed to accept, store, process, transform, make useful, and analyze data and to report results, usually on a regular, ongoing basis (Schirl&Sieler, 2012). It is often construed as a larger system including not only the database and the software and hardware (see information technology) used to manage it but also including the people using and benefiting from it and also including all necessary manual and machine procedures and communication systems(Sharif& Al-Karaghouli, 2011). The term is however also used in the broader sense of any means for communicating knowledge from one person to another, such as by simple verbal communication, punched-card systems, optical coincidence systems based on coordinate indexing, and completely computerized methods of storing, searching, and retrieving of information (Tsai & Cheng, 2012). The term is also sometimes used in more restricted senses to refer to only the software used to run a computerized database or to refer to only a computer system (Roztocki&Weistroffer, 2008).The plural term information systems (construed as singular) is also used for the academic study of the field, in other words for the study of complementary networks of hardware and software that people and organizations use to collect, filter, process, create and distribute data(Marks, 2011).Smart systems are miniaturized devices that incorporate functions of sensing, actuation, and control in order to describe and analyze a situation, and make decisions based on the available data in a predictive or adaptive manner, thereby performing smart actions. In most cases the “smartness” of the system can be attributed to autonomous operation based on closed loop control, energy efficiency, and networking capabilities (Hamaker& Hutton, 2005).Since theinformation technologyhasseveralpotential advantages. Development and deployment ofthese technologiesis not enoughto getthesebenefits. In the event ofnon-acceptanceand deploymentof newtechnologiesby userswill remaininconclusiveinvesting inthe domain of interest (Curry &Moutinho, 2012).Therefore,inthesestudywediscussof policyinthe field ofintelligent systemstechnology andweseekanswersto the following questions:What are thepolicydimensionsintelligent systemsandtheir choices?Due to limitations of the government implements and emphasis on environmental unstable conditions (economic and commercial) What isthe best optionforthe knowndimensions?

Information system and Smart systems

Information system, an integrated set of components for collecting, storing, and processing data and for delivering information, knowledge, and digital products. Business firms and other organizations rely on information systems to carry out and manage their operations, interact with their customers and suppliers, and compete in the marketplace. For instance, corporations use information systems to reach their potential customers with targeted messages over the Web, to process financial accounts, and to manage their human resources (Delak&Bajec, 2013). Governments deploy information systems to provide services cost-effectively to citizens. Digital goods, such as electronic books and software, and online services, such as auctions and social networking, are delivered with information systems. Individuals rely on information systems, generally Internet-based, for conducting much of their personal lives: for socializing, study, shopping, banking, and entertainment (Bayuk, 2009).As major new technologies for recording and processing information have been invented over the millennia, new capabilities have appeared. The invention of the printing press by Johannes Gutenberg in the mid-15th century and the invention of a mechanical calculator by Blaise

Pascal in the 17th century are but two examples. These inventions led to a profound revolution in the ability to record, process, and disseminate information and knowledge (Castano, 2012).Smart Systems provide novel enabling functionalities and as such are currently a driving force behind product innovation. Smart Systems are therefore crucial for the competitiveness of companies and entire industry sectors (Saad et al., 2013). In many ways Smart Systems development will be decisive for solving the big challenges of mankind, such as an aging society, increasing energy demand and environmental problems, etc. The global demand for highly integrated Smart Systems will increase dramatically in the years to come (Visser et al., 2013). High growth rates are particularly expected in the area of medical technologies, mobility and security, and in the consumer and communication sector. The need for higher resource efficiency, reduction of emissions and the increasing demand for "portable" solutions will further stimulate the Smart Systems market. Not just its potential high volume markets but also the high added value of Smart Systems manufacturing make this technology particularly attractive(Petter et al., 2008).

Smart systems typically consist of diverse components:
Sensors for signal acquisition,
Elements transmitting the information to the command-and-control unit,
Command-and-control units that take decisions and give instructions based on the available information,
Components transmitting decisions and instructions,
Actuators that perform or trigger the required action(Petter et al., 2008).

A major challenge in smart systems technology is the integration of a multitude of diverse components developed and produced in very different technologies and materials. Focus is on the design and manufacturing of completely new marketable products and services for specialized applications (e.g., in medical technologies), and for mass market applications (e.g., in the automotive industries) (Namani, 2010).In an industrial context, and when emphasizing the combination of components with the aim of merging their functional and technical abilities into an interoperable system, the term "smart systems integration" is used. This term reflects the industrial requirement and particular challenge of integrating different technologies, component sizes, and materials into one system(Nath&Badgujar, 2013).The systems approach calls for integrated design and manufacturing and has to bring together interdisciplinary technological approaches and solutions (converging technologies). Manufacturing companies as well as research institutes therefore face challenges in terms of specialized technological knowhow, skilled labor, design tools, and equipment needed for the research, design and manufacturing of integrated smart systems (Marks, 2011).A lot of smart systems evolved from microsystems. They combine technologies and components from microsystems technology (miniaturized electric, mechanical, optical, and fluidic devices) with other disciplines like biology, chemistry, nanoscience, or cognitive sciences(Sharif & Al-Karaghouli, 2011).There are three generations of smart systems:First-generation smart systems: object recognition devices, driver status monitoring, and multifunctional devices for minimally invasive surgerySecond-generation smart systems: active miniaturized artificial organs like cochlear implants or artificial pancreas, advanced energy management systems, and environmental sensor networksThird-generation smart systems: combine technical "intelligence" and cognitive functions so that they can provide an interface between the virtual and the physical world(Delak&Bajec, 2013).

Research Model

As mentioned**,** in this study we followed Analysis Dimensions of Policy Development of Advanced Information Systems (Smart), Management Strategy to Improve the Situation and Gain Competitive Advantage of Public Organizations By using Fuzzy Logic.

A review of fuzzy Delphi method

Fuzzy Delphi method was developed in the 1980s by Kaufman and Gupta. Application of this approach is to decision-making and consensus on issues that are not clear goals and parameters is a very significant result. This feature provides a flexible framework that covered many of the barriers related to lack of precision. Implementation of the fuzzy Delphi method combines the Delphi method and analysis on the data with definition of fuzzy set theory. Expert opinions often are offered in the form of minimum, most likely value (triangular fuzzy numbers), then the average of the experts (number given) and the difference is calculated as the sum of the average person, and then it's going to take reviews Experts with new posts. Then each expert based on the data from the previous stage, offers a new view or modifies his previous comment. This process continues until it is stable enough for average fuzzy numbers.Fuzzy Delphi Method, communication with experts is the same as Fuzzy Delphi Method yet an improved and elaborative statistical tool is used to reach in better conclusions .In the first stage of the fuzzy Delphi method, Experts are selected and are justified in particular the subject method and period of investigation. Some of the main features for Experts are as follows: Are involved with the problem discussed, havecontinuous informationfrom problem to continue cooperation, have sufficient incentive to participate in the Delphi process and feel information obtained from a collective (Asghar pour, 2004). Since the location scope agreement would be valuable for their own.Among the 167 persons of ICT experts, 133 people were selected randomly by using the sampling formula from limited community.

$$n \geq \frac{(N)*\left(Z^2_{\frac{\alpha}{2}}\right)*(p)(1-p)}{(N-1)*(E^2)+\left(Z^2_{\frac{\alpha}{2}}\right)*(p)(1-p)}$$

In this study, components of the formula are:
N=167, $z^2_{\alpha/2}$ = 1.96, P=(1-P)=0.5, E=0.06 and α=0.05. At the table below (table1) is presented the sample.

As noted, the objective of the questionnaire is awareness from opinions of experts about the identify dimensions of policy development of advanced information systems (smart). Therefore,Expertsshould express "amount" values through the variables.Qualitative variables, gives more freedom to the Experts. The use of qualitative variables such as "low", "medium", "high"can be solve the problem to some extent.Individuals comments to qualitative variables are not the same.Since the experts have different features and if answering to the options are based on different mentalitythen analysis of variables would become worthless.So by definitionthe range of qualitative variables,Experts will answer questions with the same mentality.So, qualitative variables are defined trapezoidal fuzzy numbers In Figure1. After three stages of fuzzy Delphi method, achievethe desired result. Andall oftheoptionsidentified in the research was approved by all respondents.

Fuzzy Analytical Hierarchy Process

FAHP methodology based on the concept of fuzzy set theory was introduced by Professor Lotfizadeh is founded in 1965. Multi-criteria decision making process is required to select the best among the alternatives (ErdoğanAktan and Tosun, 2013).To achieve the best ranking of DMUs, fuzzy analytical hierarchy process (FAHP) is applied (Alem et al., 2013).The FAHP is used to compute the criteria weights whereas fuzzy (Ilangkumaranaetl., 2012). In addition to the use of fuzzy scale for expressing the expert's opinion, the vagueness and uncertainty which exist in expert's opinion is considered in the proposed FAHP method (Rezazadeh at al., 2012).

The fuzzy AHP, a hierarchical structure for the problem that must be solved in order to show the relative importance of factors associated with use of fuzzy measures of relative scales. Thus, a fuzzy judgment matrix is constructed, the final scores of options offered by fuzzy numbers, and choose the best is achieved from ranking fuzzy numbers with using of specific algebraic operators (Duran and Aguilo, 2008).Concepts and definitions of hierarchical analysis fuzzy AHP according to analysis method developed. When decision makers are faced with a complex and uncertain issue of uncertain proportions as their comparative judgments "about twice as important" or "Between two to four times less important" Outlines steps and the standard AHP approach to prioritization vector can be considered as the special procedures (Duran and Aguilo, 2008).In 1996, a Chinese researcher named 'Young Chung presented "developed an analysis methods. In this methodology, the triangular fuzzy numbers of all elements of the judgment matrix and weight vector by this method, is used in most studies due to the simplicity of calculations (Wang at al, 2007).

Assuming $\tilde{A} = \{\tilde{M}_{ij}\}$ was be matrix of fuzzy paired comparison, which is defined as follows:

$$\tilde{A} = \begin{bmatrix} 1 & \tilde{M}_{12} & \dots & \tilde{M}_{1n} \\ \tilde{M}_{21} & 1 & \dots & \tilde{M}_{2n} \\ . & . & . & . \\ . & . & . & . \\ \tilde{M}_{n1} & \tilde{M}_{n2} & \dots & 1 \end{bmatrix}$$

Then will be established equation $\tilde{M}_{ji} = 1 \big/ \tilde{M}_{ij}$

Now to solve the model using EA,in each row of a matrix of paired comparisons, the value of S_k that is a triangular fuzzy number is calculated as follows:

$$S_k = \sum_{j=1}^{n} M_{kj} * \left[\sum_{i=1}^{m} \sum_{j=1}^{n} M_{ij} \right]^{-1}$$

In which, k represents the number of rows i and j, indicates options and indicators respectively. In this way,after the calculation S_k should be achieved their large degree than together.In general, If M_1 and M_2 were be two triangular fuzzy number, large degree is defined as follows:

$$\begin{cases} V(M_1 \geq M_2) = 1 & M_1 \geq M_2 \\ V(M_1 \geq M_2) = hgt\ (M_1 \cap M_2) \end{cases}$$

And if not, we have:

$$hgt\ (M_1 \cap M_2) = \frac{u_1 - l_2}{(u_1 - l_2) + (m_2 - m_1)}$$

To calculate the indicators weight in the matrix of paired comparisons we act as follows:

$$W'(X_i) = \min\{V(S_i \geq S_k)\} \qquad k = 1,2,.....,n, k \neq i$$

Therefore, the vector of indicators weight as follows:

$$W' = [W'(X_1), W'(X_2),...., W'(X_n)]^t$$

That is the vector of fuzzy AHP abnormal coefficients. Based on the equation $W_i = \frac{W_i'}{\sum W_i'}$

Normalize weights and achieve index (Azar and Farajy, 2008). The results of the ranking factors using fuzzy AHP are shown in Table 2.

CONCLUSION

Inrecent years, given that thenew technologyisadvancing rapidly, there arenew ways todeliverpublic services tocitizens which is muchmore convenientand costlevelsarecommonways. Set ofthese new approaches, would provide better government services to citizens. Serviceoffered bysmart systemswouldprovide better, fasterand withfewerrestrictionstocitizens.Policy development of new technologies such as smart systems is of particular importance. Inthisstudy, we investigateddimensionsand optionsof policy inthe area ofintelligent systemsand the rankingof options. results of thefuzzyDelphi Confirmedthe6 dimensions and16options and theresults offuzzyAHP method showed that way of formulating both specific and general policy, Indirect involvementof government, formation andentrepreneurshipin thegrowth stage, policysupportinfrastructure productsand supporting theICTfield,followedorlater development strategy, primary responsibility to Technology guidingbypublic sector havea higherpreferenceto otheroptions.advantageof ranking thisoptionisgiven the constraints of the organizations that are calling for government services through intelligent systems, optionswithhigherprioritycan helpthemachieve goalsand better results are obtained with greater emphasis on their.The useofintelligent systemsto organizationsis highlyrecommended. However, their use results inincreased costsfor the organization. But the benefits derived from the use and application of appropriate can cover costs and more efficient and will save you time as well as.

Therearemany advantagesforusersincludingreaching therequiredinformationin the shortesttime withoutreferring to the organizationandavoid wasting time. Recommendedif you havemore market shareand financial resources, theintelligent systemis used, because thenthey canat leastmaintaintheircompetitive advantagesandhavebetterpositioncompared to competitors. It is suggested thatif theconditions of use ofnew technologiessuch asintelligent systemsisto provide and people can used more easily this technology andtoachievethis visionthatuse ofnew technologycanhelpthemachieve their goalsand organization, Find Better visibility and more practical than it and thus can be a competitive advantage for their organization.Adoption of new technologies such as smart systems on behalf of users is very important for managers of organizations. Inthisregard,it should be tried, users' needs and values,better known so as toprovidereasonablegroundsfor theuse ofnewtechnology.

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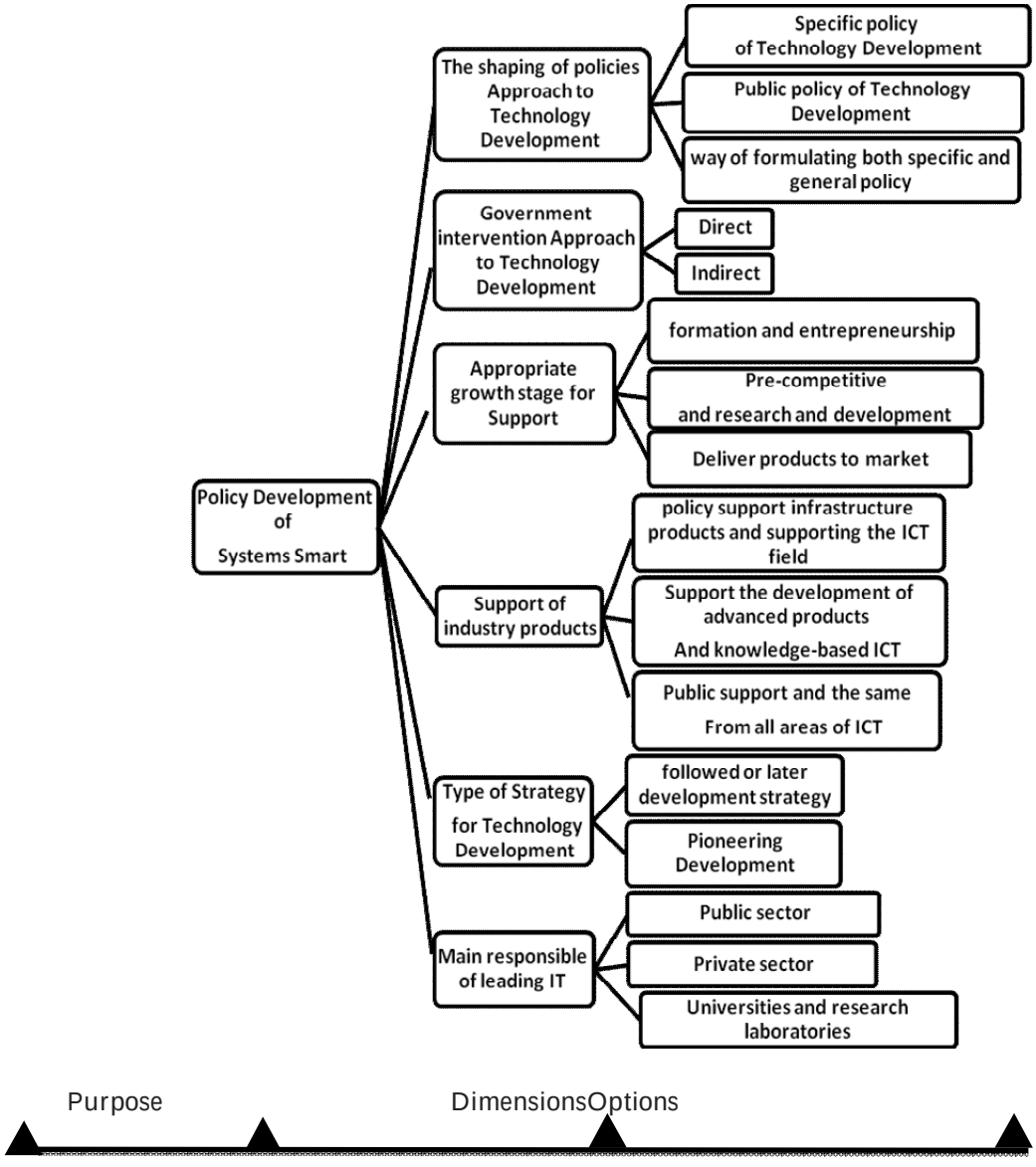

Figure1.Research model

Table1: Asampleresearch

Communities	Numberof communities	Number ofsamples
IT experts	47	42
providingpublic services Offices	120	91
Total	167	133

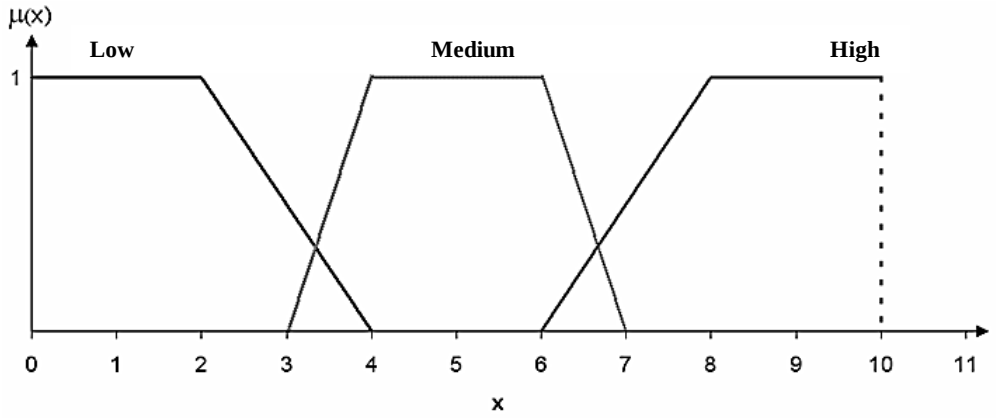

Fig2. Membership function of of linguistic variables

Table 2. Normalizedrelative weightsOptions

Row	Dimensions ofDevelopmentPolicy	options of Development Policy	Normalizedrelative weightsOptions
1	The shaping of policies Approach to Technology Development	Specific policy of Technology Development	0.040313
		Public policy of Technology Development	0.030313
		way of formulating both specific and general policy	0.166688
2	Government intervention Approach to Technology Development	Direct	0.072688
		Indirect	0.081688
3	Appropriate growth stage for Support	formation and entrepreneurship	0.030688
		Pre-competitive and research and development	0.024313
		Deliver products to market	0.051313
		policy support infrastructure products and supporting the	0.003688

4	Support of industry products	ICT field	
		Support the development of advanced products And knowledge-based ICT	0.024313
		Public support and the same From all areas of ICT	0.026313
5	Type of Strategy for Technology Development	followed or later development strategy	0.013688
		Pioneering Development	0.054313
6	Main responsible of leading IT	Public sector	0.246688
		Private sector	0.034688
		Universities and research laboratories	0.106688