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A Components Oriented Method for Evaluation of e-Government Information Systems Agility

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Abstract

A key emerging area of research in e-government is that of agility of its information systems. This because in a continuously changing political and societal environment, the systems need to be continually improved in order to accommodate unanticipated changes and evolutions. To respond to this need, policy executors are paying increasing attention to agile information systems. Evaluation of these systems agility is of critical importance; it gives measure of their readiness for change; and it may be considered as a sort of diagnosis that identifies less or non agile areas of the system on which work must be focused. This paper is in this scope and it deals with a method for evaluation of e-government Information Systems agility. This method is based on methods engineering domain; thus, it is built in the form of method components. Each component presents appropriate guidelines that realize an intention/activity within the overall evaluation process. The research methodology followed in this work is the interpretive approach **-***based on in-depth case-studies***-** *which is widely accepted in the validation research in Information Systems domain including the Electronic government area (E-government).*

Keywords: Agility, e-government, information system, evaluation, methods engineering, interpretivism.

Introduction

Changes affecting e-Government information systems stem from the permanent changes in the environment (Political, Societal, Technological, Economical, etc.) which in turn cause changes in the Governments' regulations and laws that may affect public administrations processes and systems. A change in one activity in a process or in one part of the system may cause many problems in other parts of the same process or system[1]. For example, changes in business processes; have an impact on the delivery of e-Government services[2]. These later, raise from their side several problems to manage changes as they are distributed over different IT systems and organizations. Even if they are provided and managed by a single organization, their design, development, and operation relies on the collaboration of many people with different roles[3]. Accommodating changes in such a context imposes -from one hand- the co-evolution of the front office service along with the related back office infrastructure; to satisfy customer's requirements[4], to comply with regulation and to support the government agenda[5]. From the other hand, the management of these changes with agile manner ensuring overall consistency, since the success of e-government strongly depends on the quality of its information systems.

According to this backdrop, agility in e-government becomes urgent. However, Agility evaluation has not kept pace with the actual development in e-government practice. This is not the result of omission rather; it reflects the degree of complexity inherent in developing appropriate evaluative criteria and metrics. The complexity is mostly due to the multidimensionality of the concept, the multiple perspectives involved, the uncertainties about precisely what it is to which one needs to adapt, and the lack of knowledge about how to measure agility. This paper aims to propose a practical method for the evaluation of e-government information systems agility. To construct this method from *scratch*, we are based on *methods engineering* domain. A method according to this domain treats the two aspects of engineering: the *product* and the *process*; and thus comprises two elements: one or more *product models* and one or more *process models*[6]. The product is the result to reach. The process is the way which should be traversed to reach the result. Indeed, the product model prescribes what the awaited characteristics of the manufactured product are. The process model prescribes methodological steps to reach the target product.

The logical organization of this paper goes as follows. The next section discusses the literature background of this paper which is twofold. First, it reviews prior research dealing with the concept of agility. Then, it presents the existing state of the art dealing with agility evaluation approaches. The section following that, presents our proposed approach. Finally, conclusions are drawn and future research plans are discussed.

Literature Back Ground

Agility of Information Systems: The concept of agility has been developed for the first time in the fifties in the domain of air combats[7]. It was originally defined as the ability to change maneuvers in time. At the early nineties, this concept has been extended to manufacturing systems with the publication of a report by the Iacocca Institute (Lehigh University, USA) entitled *21st Century Manufacturing Enterprise Strategy*[8]. In this report, agility was described as a new industrial order for competitiveness in a volatile manufacturing marketplace. At the mid nineties, and face to the software crisis of the 1960's, agility was introduced into software development upon the notion of agile methods. Thereafter, the concept of agility was extended to business processes and networks[9], enterprise information systems[10], decision support systems[11], supply chains[12] and so on. At the early twenties, the formation of Agile Alliance and the publication of the *Agile Manifesto*[13], have played a key role in the emergence of agility in the all fields of research -among them the e-government field which makes the object of this paper.

Despite the age of the concept, there is no consensus yet on what agility exactly is. However, different facets of agility have been emphasized by multiple authors and this has lead to varied views reflected in the literature. According to Martensson[14], agility is more synonymous with the ability of reconfiguration. It is also defined as synonymous with vigilance[15], flexibility[16], reactivity[17] and sometimes with adaptability[18]. Although all these synonymous have the same driving objective: response to change, agility is distinguished in term of speed in responding to change[19]. In this sense, Oosterhout and Waarts[20] argued that the concept of speed is at the core heart of agility.

Agility evaluation approaches: The works on agility evaluation can be mainly classified in evaluation of: e-government information systems agility[19], enterprise information systems agility[10], manufacturing systems agility[21] and evaluation of socio-technical systems agility[22].

Within the context of e-government, Gong and Janssen[19] proposed four principles for creating agility in e-government information systems -particularly in BPM (Business Process Management) systems: i. formulating the business process using business services, ii. integrating and orchestrating business services, iii. separating process, knowledge and resource; and iv. implementing policy by collaboration. Then, based on scenarios derived from the case study, the authors evaluate the level of agility using a set of quantitative and qualitative measures that are defined for each one of the four principles.

Within the context of enterprises, Imache et al.[10] proposed POIRE framework for the measurement of agility of enterprise information systems. POIRE refers to the five dimensions of an enterprise information system (EIS): Process, Organization, Information, Resources and Environment. According to POIRE, agility is measured according to a certain number of agility factors that are defined for each dimension of the enterprise information system using a set of evaluation criteria. Moreover, the authors proposed a mechanism for the regulation and preservation of agility. Regulation consists in equilibrating in time the levels of production and consummation of the EIS agility. Preservation consists in maintaining in time the EIS agility in a level, which will make it possible to maintain its durability (sustainability).

Within the context of manufacturing, Tsourveloudis et al[21] proposed a fuzzy logic-based framework to evaluate the agility of manufacturing information systems. In this framework, the agility is evaluated according to the four infrastructures of the manufacturing system: i. production ii. market, iii. people, and iv. information. These infrastructures are combined with their corresponding operational parameters to determine the overall agility of the system. Then, the assessment of agility is based on an approximate reasoning method taking into account the knowledge that is included in the fuzzy IF-THEN rules.

Finally, Lui and Piccoli[22] proposed a framework to evaluate the agility of information systems from the socio-technical perspective. In this last, the information system is considered as composed of two sub-systems: a technical system and a social system. The technical sub-system encompasses both technology and process. The social sub-system encompasses the people who are directly involved in the IS and reporting the structure in which, these people are embedded. To measure the information system agility using the socio-technical perspective, Lui and Piccoli used the agility of the four components: i. technology agility, ii. process agility, iii. people agility, and iv. structure agility. The authors argued that, the overall agility of the system is not a simple summing of the obtained scores of agility in these four components, but it depends on their non linear relationships. To this end, the authors used the fuzzy logic membership functions to evaluate agility.

Although all the presented works on agility evaluation are important -each one in the context in which it is applied-; two main common lucks can be observed: i. the *universality* and ii. the *rigidity* of the proposed approach. Indeed, the presented works proposed generic evaluation approaches (global evaluation processes) that luck of the detailed guideline of activities. However, studies on the practice of methods highlighted faults and limits of universal methods. In this sense, Rolland[4] argued that universal methods are informal and non-precisely defined. They are narrowed by suggesting global sequential process without a *fine guideline* of activities. Practically, this leads to: i. an ill apply of the method: inquiries showed that universal methods are never applied as it should be[23]; and ii. a supplementary work for managers[24]. To avoid these problems, a method should provide sufficient and detailed guideline of activities.

In addition, most of the presented works are characterized by the rigidity of the proposed approach, i.e. the non ability to be adjusted to a specific situation of use. According to Parkinson[25], universal methods generally treat all the projects (situations) as same. However, practice proved that internal and external constraints of each project are different. By treating all the projects as same, methods conducts to an absence of value added for a particular project. To avoid this problem, a method should provide sufficient flexibility to be adapted/ adjusted to the specific situation in which it is applied.

It is against this backdrop that the domain of *situational methods engineering* was born[26]. The aim of situational methods engineering (SME) is to construct methods that can be adapted to the specific situations in which they are applied while providing a fine guideline of activities. Our work presented in section 4 is based on situational methods engineering and proposes a method for the evaluation of e-government information systems (e-govIS) agility. The proposed method is made of 4 method components; each one of them provides a fine guideline of activities and can be adjusted according to the level of integration (3 levels) of the considered e-govIS.

The Research approach

Selecting the appropriate research approach requires considering a number of contextual factors and then reflecting them against the backdrop of the research question. Yin[27] has identified these factors and proposed several criteria for selecting a suitable research approach. In this paper, we have carefully considered these criteria; as a result, the interpretive approach[28] based on in-depth case-studies was chosen as the most appropriate approach to evaluate e-government information systems agility.

Based on the interpretive methodology (figure-1), we defined first the universe of content of our study. In other words after the literature survey presented in Section 2, the boundaries of the research or the construct of interest -Agility of e-govIS- were defined; and we established an exhaustive candidate list of items from the domain of all possible items consisting of the construct *agility of e-government information systems.* Thus, a sample of agility *criteria* (33 criteria) arranged in agility *dimensions* (6 dimensions) were defined within a *conceptual analysis grid* (table-1).

Each dimension (D_i) constitutes a questionnaire that is based on the criteria (C_j) which correspond. Different types of data and information are used to answer questions (see case study). Metrics are re *normalized* on a likert-5 scale, i.e. each dimension is measured using a five point Likert scale -from (1) very low to (5) very high ($0 \leq$VeryLow≤ 1; $1<$low≤ 2; $2<$Average≤ 3; $3<$High≤ 4; $4<$Very high≤ 5).

The Evaluation method

Product model: The product model of the proposed method (figure-3) is presented by the *integrated model*[29] which contains two types of links between the concepts: the link of existency/ dependency and the link of generalization/ specialization.

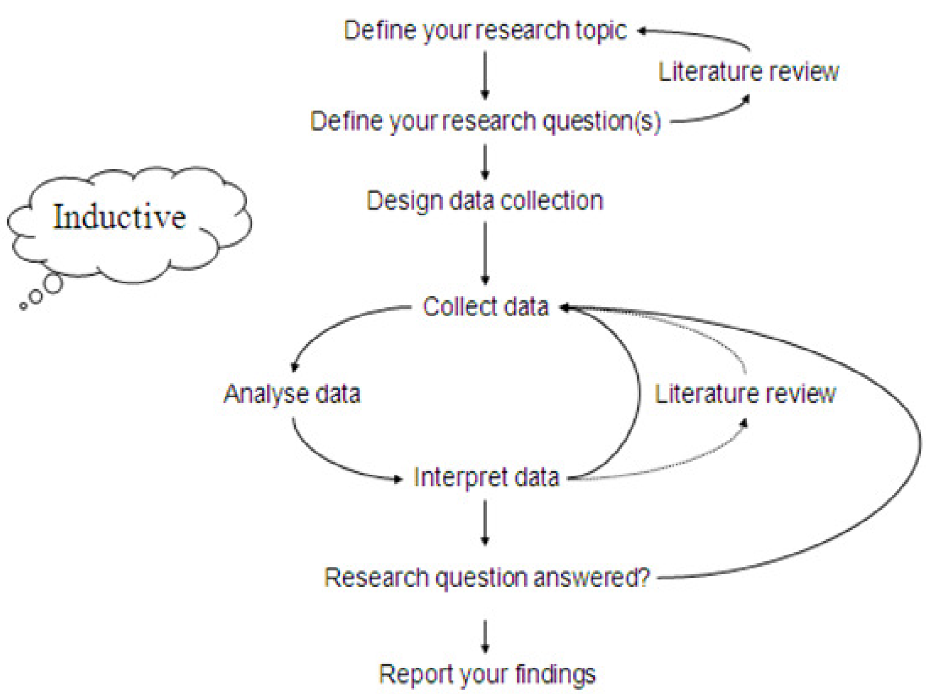

Figure-1
The interpretive methodology

Table-1
Prototype screen of the conceptual analysis grid of agility evaluation

Dimensions	Criteria	Metrics	Comments
Flexibility	Flexibility of the electronic portal to changes/evolutions of technology.		
	Flexibility of the electronic portal to changes/ evolutions of end-users requirements.		
	Flexibility of the electronic portal with the end users browsers and operating systems.		
	Flexibility of services to legislative changes/evolutions.		
	Flexibility of services to end-users preferences and choices.		
Agility of the dimension			
Adaptability	Adaptability of the electronic portal to the end users language		
	Adaptability of the electronic portal to disable end users		
	Adaptability of the internal organization to structure/hierarchy changes.		
	Adaptability of the business processes to technological changes.		
	Adaptability of the business actors to business processes changes.		
Agility of the dimension			
Reactivity	Timeliness (services are performed with higher response time).		
	Responsiveness (services respond right from the first time).		
	interactivity (services are performed through interactive interfaces).		
	Controlability (checking of non authorized options by warning messages)		
	Actuality (up to dates information and services).		
Agility of the dimension			
Robustness	Robustness of the electronic portal to bad manipulations of the end-users.		
	Robustness of the internal system to bad manipulations of the business actors.		
	Ability of the electronic portal to restore data in case of ab-normal situations.		
	Ability of the internal system to restore data in case of loose or destruction.		
	Ability of the internal system to ensure minimum of service in ab-normal situations		
Agility of the dimension			
Integration	use of communication and integration technologies		
	use of measures of format of compatibility of electronic data interchange		
	Integration of the front office portal with the back office system.		
	Vertical integration of the system across local, state and federal systems.		
	Horizontal integration of the system across functional levels (services).		
Agility of the dimension			
Total Degree of Agility of the system			

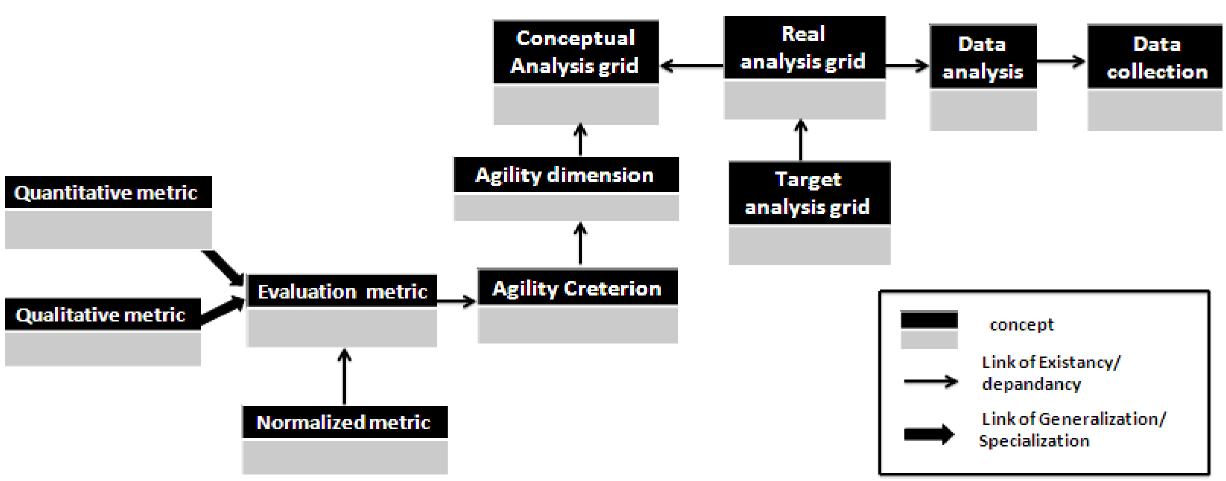

Figure-3
Fragment 1 of the product model of the proposed method

The existential dependency link allows linking two concepts where the source concept cannot exist without the target concept. As for example (figure-3), the concept *data analysis* cannot exist without the concept *data collection*. The specialization/generalization link allows linking a more specialized concept (the source concept) to a more generalized concept (the target concept). As for example (figure-3), the concepts *quantitative metric* and *qualitative metric* specialize the concept *evaluation metric*.

As shown the first fragment of the product model (figure-3), the products of the proposed method are *Analysis grids* for agility evaluation. First, we established a *conceptual analysis grid* from the literature review. As it had been said previously, this grid contains a list of agility *dimensions*; each one of them is obtained by a combination of agility *criteria*. In order to confirm (i) whether the samples of criteria capture their corresponding dimensions and (ii) whether the samples of dimensions capture the concept of agility, a questionnaire based on agility criteria is designed to elicit and assess information. *Questions* are measured by evaluative *metrics* which may be of different natures (*quantitative, qualitative*); so in order to unify the interpretation of the results and calculus, evaluation metrics are *normalized* on a likert-5 scale, i.e. each dimension is measured using a five point Likert scale -from (1) very low to (5) very high (0≤VeryLow≤1; 1<low≤2; 2<Average≤3; 3<High≤4; 4<Very high≤5).

Thereafter, the conceptual analysis grid can be refined based on *data collected* from the case study, i.e. after an appropriate number of *data analysis* rounds**,** the conceptual grid is purified based on reliability and validity coefficients (details/guidelines are given in the process model (section 4.2)); thus, the *real analysis grid* is obtained. This last is used to evaluate the *real degree of agility* of the e-govIS. Next, the *target analysis grid* is generated from the real grid (figure-3) to determine the *target degree of agility* of the e-govIS (figure-4) (details/guidelines are given in the process model (section 4.2)). Finally, the *agility gap* (AG) is calculated as the difference (gap) between the Target Degree of Agility (TAD) and the Real Degree of agility (RAD). i.e., AG= TAD-RAD.

In order to better apprehend agility, our approach, defines three agility assessment models[30] according to the three integration levels of the e-government information system (table-2).

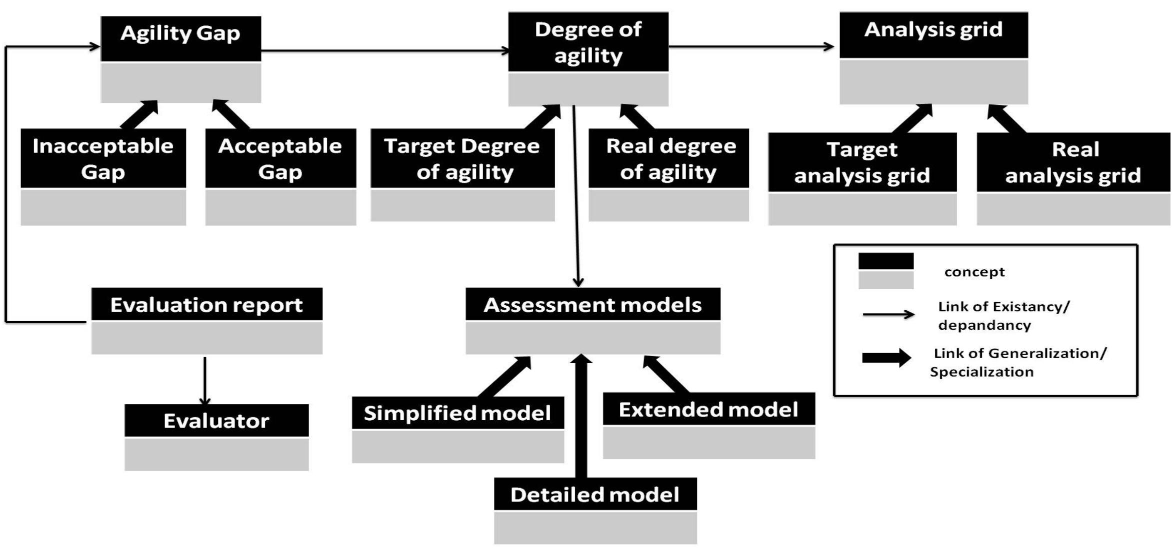

Figure-4
Fragment 2 of the Product model of the proposed method

Table-2
Agility assessment models according to the e-govIS level of integration

e-GIS integration	Description	Assessment model
Level 1	Integration of The FO service along with the related function BO system within the same e-govIS.	Simplified model
Level 2	Integration of the e-govIS across local, state and feder systems (vertical integration).	Extended model
Level 3	Integration of the e-govIS across different local, state and federal functions/services (Horizental integration).	Detailed model

Level 1: in this level the government's strategy focuses only in integrating the front office portal (FO) to the internal functional back office system (BO) within the same e-govIS (figure-5).

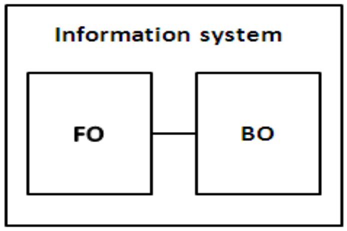

Figure-5
Integration of the FO service to the BO functional system

According to this low level of integration, a simplified assessment model is associated. This model evaluates agility using the following formulas (1):

To measure the Agility of a given dimension (A_{Di}):

$$A_{Di} = \left(\sum_{J=1}^{NC} M_J \right) \; / \; NC \qquad (1)$$

Where: M_j : metric of the j^{th} criterion of D_i (M Є [0,5]); NC: number of criteria of D_i.

To measure the overall Agility of the e-govIS:

$$A_{e-govsIS} = \left(\sum_{i=1}^{ND} M_i \right) \; / \; ND \qquad (2)$$

Where: A_{Di} : Agility of the i^{th} dimension, ND: number of dimensions.

Level 2: a natural progression of level 1, will be the integration of the scattered systems at different levels of the government (local, state and federal) (figure-6). If a citizen conducts a transaction with a local agency, the transaction information will be propagated to state and federal counterparts and vice-versa.

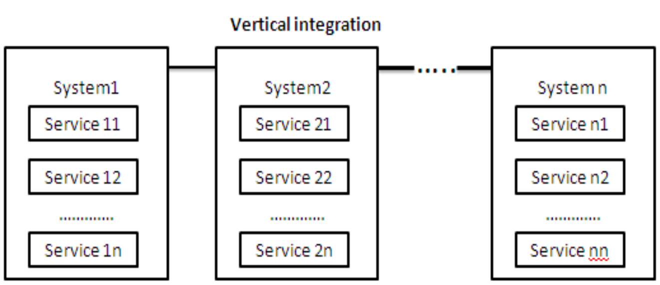

Figure-6
Vertical integration of the e-govIS

In this level of integration, dimensions such as **integration** and **security** become more important. Hence, an extended model which takes into account the weights of dimensions is associated. This model evaluates agility of the dimensions using the precedent formulas (1) and the overall agility of the e-govIS using the following formula (2bis).

$$A_{e-govIS} = \left(\sum_{i=1}^{ND} A_{Di} \; * \; \lambda_{Di} \right) \; / \; \sum_{i=1}^{ND} \lambda_{Di}$$

(2 bis)

Where: A_{Di} : Agility of the dimension i; λ_{Di}: The weight of the dimension i; ND: number of dimensions.

Level 3: while the vertical integration consists in integrating the e-govIS across different levels of government, the horizontal integration (figure-7) consists in integrating the e-govIS across different functions and services in that a transaction in one agency can lead to automatic checks against data in other functional agencies.

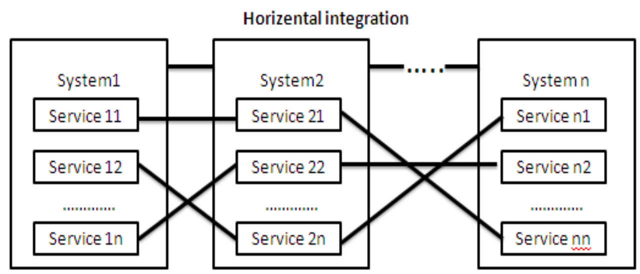

Figure-7
Horizontal integration of the e-govIS

The horizontal integration of government services across different functions of government will be driven by certain criteria such as communication and integration technologies, format of compatibility of electronic data interchange, etc. Hence, a detailed assessment model which takes into account the weights of criteria- is associated. This model refines the precedent model which that takes into account the weights of dimensions and evaluates agility of the dimensions using the precedent formula (2bis) and the overall agility of the e-govIS using the following formula (1bis):

$$A_{Di} = \left(\sum_{j=1}^{NC} M_j \; * \; \lambda_{Cj} \right) \; / \; \sum_{j=1}^{NC} \lambda_{Cj} \qquad (1\text{ bis})$$

Where: M_j : metric of the j^{th} criterion of D_i; λ_{Cj}: is the weight of the criterion j; NC: number of criteria of D_i.

Process model: Within methods engineering, the decomposition of a method into components means the decomposition of its process model into *method components*. As shown figure-8, the process model of the proposed method is decomposed into 4 method components; each one of them presents appropriate guidelines that realize an intention/activity within the evaluation process.

This process model is presented by the MAP formalism. The MAP[30] is a labeled directed graph where nodes are intentions whereas edges are labeled with strategies to achieve these intentions. **Start** and **end** are standard intentions of MAP that mark respectively the beginning and the end of the process.

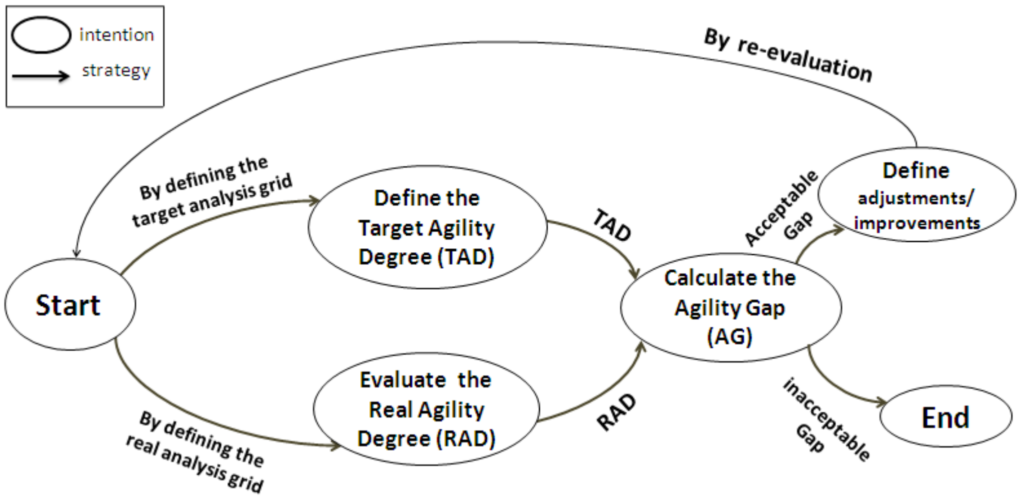

Figure-8
Process model of the proposed method

Guidelines for evaluating the real agility degree (RAD): the evaluation of the real agility degree of the e-govIS is based on constructing the real analysis grid as follows: i. Setting agility metrics (from [1 to 5]) for each criterion of the conceptual analysis grid according to the analysis of data collected from the case study, ii. Confirming (i) Whether each sample of criteria captures its corresponding dimension and (ii) Whether the sample of dimensions captures the construct of agility. To this end, we calculate first reliability coefficients (coefficient Cronbach's alpha)[31] with an acceptance level at least 0.7. Then, using the Churchill's recommendation[32]*: "a sample of items can be purified by examining each corrected item to total correlations; and then desecrating items whose elimination improved reliability of the construct until no item's removal increased the construct's overall reliability*", dimensions can be refined by reducing their corresponding samples of criteria; and the conceptual grid can be refined by reducing its sample of dimensions. Thus, a refined/purified analysis grid that we call *real analysis grid* is obtained. iii. Evaluating the agility of dimensions of the real analysis grid using formulas (1) or (1bis) (depending to the level of the e-govIS integration, see assessment models). iv. Finally, evaluating the overall Real Agility Degree (RAD) of the e-govIS using formulas (2) or (2bis) (depending to the level of the e-govIS integration, see assessment models).

Guidelines for defining the target agility degree (TAD): The definition of the target degree of agility of the e-govIS is based on constructing the target analysis grids as follows: i. Re-setting agility metrics (from [1 to 5]) for each criterion of the real analysis grid so that each metric represents the ideal score a criterion should have in the considered e-govIS. To this end, collaboration with experts may be necessary to determine the extent (from [1 to 5]) to which a criterion should be scored. ii. Evaluating the agility of dimensions by using formulas (1) or (1bis) (depending to the level of the e-govIS integration, see assessment models). iii. Finally, evaluating the overall Target Agility Degree (TAD) of the e-govIS using formulas (2) or (2bis) (depending to the level of the e-govIS integration, see assessment models).

Guidelines for calculating the agility gap (AG): Once the target agility degree (TAD) is compared to the real agility degree (RAD), calculating the agility gap (AG) as follows: i. Calculating the difference: AG = TAD – RAD. ii. Concluding by the mentions of:

$$\begin{cases} \text{Acceptable Gap} & \text{if AG is low or very low (AG} \in [0,2]). \\ \text{Inacceptable Gap else} & (\text{AG} \in]2,5]). \end{cases}$$

With: 0≤VeryLow≤1; 1<low≤2; 2<Average≤3; 3<High≤4; 4<Very high≤5.

Practically, the Acceptable Gap means that the "gap" between the target and the real agility degrees is low; indeed, the considered e-govIS is agile; in which case evaluation is ended (figure 7); whereas the Inacceptable Gap means the contrary, i.e. the gap between the target and the real agility degrees is high; indeed, the considered e-govIS is not agile; in which case some improvements and adjustments are needed (figure 7).

Guidelines for defining adjustments and improvements: To determine the necessary improvements, a mapping between the target analysis grid and the real analysis grid is necessary in order to determine non agile dimensions on which work must be focused.

Non agile dimensions are determined as follows: i. Calculating the agility gaps (AG) for all pairs of target and real agility degrees of the dimensions. ii. Concluding by the mentions of:

$$\begin{cases} \text{Agile dimension} & \text{if AG is low or very low.} \\ \text{Non agile dimension else} & \end{cases}$$

Conclusion

Electronic government is every day in perpetual evolution; which makes the agility of its information systems a necessary preliminary towards their sustainability. In this paper we presented the main approaches dealing with evaluation of information systems agility according to different contexts/domains. Although all these approaches are important each one in the context in which it is applied, most of them are characterized by the universality and rigidity of the methodological process. However, studies on the practice of methods highlighted faults and limits of universal methods. Against this backdrop, our proposed method -based on situational methods engineering- provides a fine guideline of activities to evaluating e-govIS agility; using the notion of method components.

The proposed method is actually under validation in a practical case study which is conducted within the Ministry of Posts and Technologies of Information and Communication (MPTIC) within the project of E-Algeria 2013.

The presented method is implemented via a software prototype with limited functionalities. An immediate perspective for this work is to develop a fully functional expert system that assists data collection and automates calculus.

References

1. Mentzas G., Knowledge and Semantic Technologies for Agile and Adaptive Egovernment, 7th Global Forum on Reinventing Government: Building Trust in Government 26 – 29 June **2007**, Vienna, Austria **(2007)**
2. Apostolou D., Mentzas G., Stojanovic L., Thoenssen B. and Lobo T.P., A collaborative decision framework for managing changes in e-government services, Government Information Quarterly, **28(1)**, 101–116 **(2011)**
3. Droudi H. and Dindar F., An Investigation on the Relation between Human Resources Management and Organizational Developments, *Res. J. Recent Sci.,* **2(2),** 50-53 **(2013)**
4. Haghtalab H., GharibTarzeh Z. and Nabizadeh T., Investigating the Effects of Electronic Satisfaction Factors on Forming Electronic Satisfaction of Website Services in Tourism Industry, *Res. J. Recent Sci.,* **1(11)**, 1-8 **(2012)**
5. Satish B. and Sunil P., Study and Evaluation of users behavior in e-commerce Using Data Mining, *Res. J. Recent Sci.,* **1(ISC-2011)**, 375-387 **(2012)**
6. Rolland C., L'ingénierie des méthodes : une visite guidée». e-TI - la revue électronique des technologies d'information, Premier Numéro, 25 octobre 2005 **(2005)**
7. Richards C.W., Agile manufacturing: beyond lean? *Production and Inventory Management Journal*, **37(2)**, 60-4 **(1996)**
8. Nagel R. and Dove R., 21st Century Manufacturing Enterprise Strategy, Incocca Institute, Leigh University **(1991)**
9. Burgess T.F., Making the leap to agility: defning and achieving agile manufacturing through business process redesign and business network redesign, *International Journal of Operations and Production Management,* **14(11),** 23-34 **(1994)**
10. Imache R., Izza S. and Ahmed-Nacer M., An Enterprise Information System Agility Assessment Model, *Computer science and information systems*, **9(1)**, 107-133 **(2012)**
11. Huang C., An agile approach to logical network analysis in decision support systems, Decision Support Systems, **25(1)** 53-70 **(1999)**
12. Naylor J.B., Naim M.M. and Berry D., Leagility: Interfacing the Lean and Agile Manufacturing Paradigm in the Total Supply Chain, *International Journal of Production Economics*, **62**, 107-118 **(1999)**
13. Fowler M. and Highsmith J., The Agile Manifesto. Software Development **(2001)**
14. Martensson A., Producing and Consumming Aigility. In: Desouza, K.C. (ed.) Agile Information Systems: Conceptualization, Construction, and Management, 41–51, Elsevier, Burlington, ISBN 10: 0-7506-8235-3 **(2007)**
15. Houghton R.J., El Sawy O.A., Gray P., Donegan C. and Joshi A., Vigilent Information systems: the western digital experience, In: Desouza, K.C. (ed.) Agile Information Systems, Conceptualization, Constuction and Management, pp. 222–238. Elsevier, Berligton, ISBN 10:0-7506-8235-3 **(2007)**
16. Sharifi H. and Zhang Z., A methodology for achieving agility in manufacturing organizations: An introduction, *International Journal of Production Economics*, **62(1-2),** 7-22 **(1999)**
17. Lindberg P., Strategic manufacturing management: a proactive approach, *International Journal of Operation and Production Management*, **10(2)** 94-106 **(1990)**
18. Kidd T.P., Agile Manufacturing: Forging New Frontiers, London, Addison-Wesley **(1994)**
19. Gong Y. and Jenssen M., From policy implementation to business process management: Principles for creating flexibility and agility, Government Information Quarterly, **29(1),** 61–71 **(2012)**
20. Van Oosterhout M.P.A., Waarts E. and Van Heck E., Business agility: Need, readiness and alignment with IT strategies, In K. C. Desouza (Ed.), Agile information systems: Conceptualization, construction and management (52–69), Burlington: Elsevier **(2007)**
21. Tsourveloudis N., Valavanis K., Gracanin D. and Matijasevic M., On the Measurement of Agility in

Manufacturing Systems, Journal of Intelligent and Robotic Systems, Kluwer Academic Publishers Hingham, MA, USA, **33(3)** 329–342 **(2002)**

22. Lui T.W. and Picolli G., Degree of agility : Implications from Information Systems Design and Firm Strategy, In Desouza K.C editor, Agile information Systems, Conceptualization, Constuction and Management, Elsevier, berligton, USA, 122-133 **(2007)**

23. Russo et al., The Use and Adaptation of System Development Methodologies, Proceeding of the International Resources Management, Association (IRMA) Conference, Atlanta **(1995)**

24. Siau K., Information Modeling and Method Engineering: A Psychological Perspective, *Journal of Database Management*, **10 (4) (1999)**

25. Parkinson, 60 Minute Software-Strategies for Accelerating the Information Systems Delivery Process, John Wiley & Sons, New York **(1996)**

26. Welke R.J. and Kumar K., Method Engineering: A Proposal for Situation-specific Methodology Construction, in Systems Analysis and Design : A Research Agenda, Cotterman and Senn(eds), Wiley, 257-268 **(1992)**

27. Yin R.K., Case study research: Design and Methods, 2ndEdition, Sage Publications, Thousand Oaks, CA **(1994)**

28. Walsham G., Doing Interpretive Research, *European Journals of Information Systems*, **(15)** 320-330 **(2006)**

29. Khadraoui A., Léonard M., Pham Thi TT. and Helfert M., A Framework for Compliance of Legacy Information Systems with Legal Aspect, AIS Transactions on Enterprise Systems journal, 1867-7134, GITO mbH, 15-26 **(2009)**

30. Rolland C., Parakash N. and Benjamen A., A multi Model view of Process Modelling, Springer, Heidelberg, **4(4)** 169–187 **(1999)**

31. Cronbach L.J., Coefficient alpha and the internal structure of tests, Psychometrika, **(16)** 297–333 **(1951)**

32. Churchill G.A., A paradigm for developing better measures of marketing Constructs, *Journal of Marketing Research*, **(16)** 64–73 **(1979)**

33. Mehdi S. and Gholami Avati R., Investigating the Asymmetric Effects of Government Spending on Economic Growth, *Res.J.Recent Sci.,* **1(5)**, 51-58 **(2012)**