

Enriching Soft Systems Methodology (SSM) With Hermeneutic in e-Government Systems Development Process

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Abstract

e-Government system has been developed in various countries. e-Government system can support the government's performance in serving the public. Because there are many aspects that must be considered, then the e-Government system development process can be very complex. Soft Systems Methodology (SSM), that is based on soft system thinking, is suitable for use in the e-Government system development process. Hermeneutic can be used to enrich SSM. Hermeneutic can be used to uncover knowledge, specifically from the interview or Focus Group Discussion (FGD) result. Hermeneutic can be done using hermeneutic circle principle. Hermeneutic can be used in the first step, the second step and the sixth step of SSM.

Keywords: *e-Government, Soft Systems Methodology, Hermeneutic*

1. Introduction

Currently the development of e-Government systems have been proliferated in several countries, both in developing countries and developed countries. The development of e-Government system can support the government's performance in serving the public.

e-Government is the use of Information Technology (IT) by public sector organizations [1]. Other definition of e-Government is public sector use of the Internet and other digital devices to deliver services, information, and democracy itself [2].

e-Government is closely related to computer, information and cyber world. Thus, Ramadhan, Sensuse, and Arymurthy said in [42] that computer ethics, information ethics, and cyber ethics are the foundation for e-Government ethics.

The main orientation of e-Government is the accessibility of information by the public [1]. Heeks in [1] says that e-Government is also an information system, but it is enriched with various aspects, such as the management aspects, political aspects, economical aspects and others. These aspects have to be considered by developers when developing an e-Government system.

Because many aspects that must be considered, then the e-Government system development process can be very complex. These aspects can not be observed separately, but should be observed as a whole, where there is interaction in it. Such characteristics can be solved using systems thinking.

The approach of systems thinking is fundamentally different from the traditional form of analysis [3]. Instead of focusing on the individual pieces of what is being studied, systems thinking focuses on the feed-back relationship between the thing being studied and the other parts of system [3]. Therefore instead of isolating smaller parts of a system, systems thinking involves a broader view, looking a larger numbers of interactions [3]. In this way, systems thinking creates a better understanding of the big picture [3]. Based on the above explanation, it can be said that the systems thinking is more holism and non-reductionism.

There are two forms of systems thinking, i.e. hard systems thinking and soft systems thinking. Hard systems thinking assumes the world is mechanic, contains systems which can be modeled and "engineered" [4]. Hard systems thinkers assume reality to be objective, that reality looks the same regardless of who is the observer [4]. Soft systems thinking do not assume that the world is systemic and well-ordered; on the contrary, it assumes social reality to be "problematical", characterized by multiple angles of approaches and perspectives [4]. The understanding of reality is dependent upon the observer,

his interpretations and what he chooses to focus on [4]. This suggests that soft systems thinking is more subjective than objective.

e-Government is a socio-technical system that consists of soft components and hard components [1]. It could be argued that the soft component is the people who are involved in e-Government, whereas the hard component is the Information Technology (IT) that being used. The management approach of the soft component is likely inspired by social sciences, it tends to be subjective, qualitative, and further highlight by the aspects of humanism [1].

Because of the existing of soft component in e-Government that tends to be subjective as stated in [1], then we consider that soft system thinking is suitable for use in the e-Government system development process. Some of the methodologies that can be used in soft systems thinking is a meta-synthesis approach as used in [5], and Soft Systems Methodology (SSM). From these two options, we chose SSM as a basis in our discussion of this paper. In addition, we also will explain that hermeneutic can be used to enrich the methods that already exist in the SSM.

2. Enriching Soft System Methodology

Soft Systems Methodology (SSM) was proposed in 1981 by Peter Checkland [6]. As the name implies, SSM is based on soft systems thinking. The picture of SSM can be seen in Fig. 1.

SSM consists of seven steps, i.e (extracted from [6]):

- 1) The identification of a problem situation that demands attention
- 2) Problem situation is expressed. The expression can be described using the Rich Picture Diagram. The examples of the Rich Picture Diagram can be seen in Fig. 2.
- 3) Some relevant human activity systems, potentially offering insight into the problem situation, are selected and from these 'root definitions' are built. In this step, CATWOE analysis is performed. CATWOE stands for Customers, Actors, Transformation process, World view, Owner, and Environmental constraints.

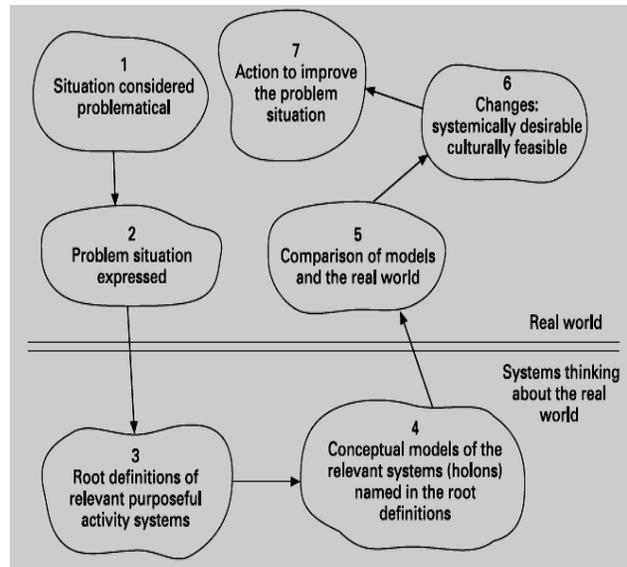


Figure. 1. The seven-step of Soft System Methodology (SSM) [6].

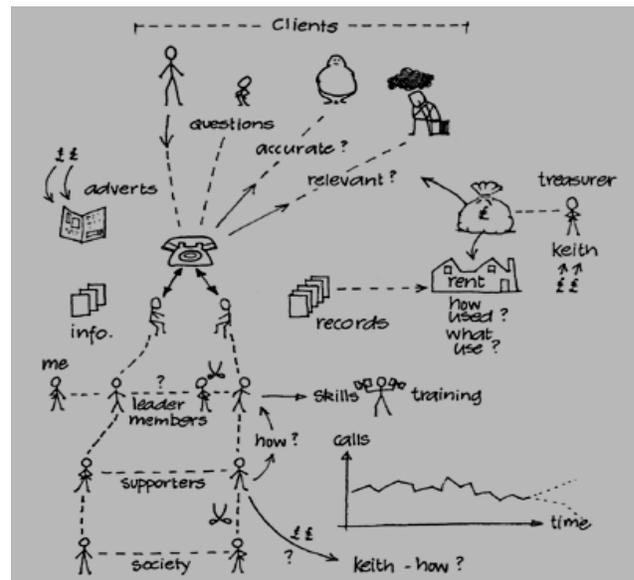


Figure. 2. Part of a rich picture of a telephone helpline situation[7].

- 4) Construct conceptual models. This is the most important step in the SSM. Various modes of modeling techniques can be applied at this step.
- 5) Comparing the conceptual model with the real world. The aim is to provide material for debate about possible change among those interested in the problem situation. This step shows the social processes within the SSM.
- 6) Making changes to the model by accommodating the interests of several actors involved. Changes should be able to follow the desired model but still possible (feasible) historically, culturally and politically. Changes may include changes in attitudes, structures,

or procedures.

- 7) Perform various activities to implement the model and fix the problem. In this step, the conclusions are drawn and long-term solution is formulated.

SSM has been amended several times. The first change is made in 1990 in the form of "two-strands model" as shown in [6]. In this model, were added three types of inquiry, referred to as Analysis 1, 2 and 3 [6]. Analysis 1 considers the intervention itself and the roles of client, problem-solver and problem-owners. Analysis 2 is social system analysis. Analysis 3 examines the politics of the problem situation and how power is obtained and used [6].

Subsequent changes of SSM is made when the original seven-step is merged into just four steps [8]. The new four-step is named as "learning cycle of SSM". Four new steps are [8]:

- 1) Finding out about a problem situation, including culturally/politically.
- 2) Formulating some relevant purposeful activity models
- 3) Debating the situation, using the models, seeking from that debate both :
 - a. changes which would improve the situation and are regarded as both desirable and (culturally) feasible
 - b. the accommodations between conflicting interests which will enable action-to-improve to be taken
- 4) Taking action in the situation to bring about improvement.

Although the SSM has been amended several times and although Checkland no longer favours it, the representation of SSM as a seven-step, which appeared in 1981, is still frequently used today [6]. Some examples of the use of the seven-step of SSM can be seen in the [9], [10], [11], [12] and [13].

Yang & He use the seven-step of SSM for regional planning and improvement of industrial structure in Guangdong, China [9]. Jianmei & Zheng use the seven-step of SSM to analyze the soft conflict of interest problem [10]. Lehaney & Paul use the seven-step of SSM in simulation modeling [11]. Dirker *et. al.* in [12], using a seven-step SSM to manage the distribution channels in a production market. Kang & Hu in [13], using a seven-step SSM within the logistics system.

Besides just using it, some researchers have also tried to adding a new method to the SSM or mixing SSM with others. Biggam equipped the seven-step of SSM with knowledge type, to facilitate the process of knowledge capture in the website environment [14]. Yinghong in

[15], complete the seven-step of SSM with integrated decision making knowledge system in decision-making process. Razali *et. al.* in [16] integrate the seven-step SSM into the Design Science Research (DSR) for modeling a system framework. And the new one, Ramadhan, Sensuse and Arymurthy in [17], adding the Focus Group Discussion (FGD) method in the step two and the step six of the seven-step of SSM.

In this paper we try to enrich the SSM with the hermeneutic. We suggest that with the addition of hermeneutic into the SSM, then the process of uncover knowledge, in the e-Government system development process, can be done better.

3. Hermeneutic and Hermeneutic Circle

Hermeneutic generally used in interpretive research. Hermeneutics can be considered as a theory or philosophy of the interpretation of meaning [18]. Not just a theory, hermeneutic also is the study of practice in understanding and interpretation.

The name hermeneutics is associated with "Hermes", the Greek god of communication, the borders, the limits [19]. It represents the crossing of paths and the coincidence of moments [19]. The term 'hermeneutic' derives from Greek language for 'to interpret' or 'to understand' [20].

Hermeneutics is primarily concerned with the meaning of text [21]. Hermeneutic initially focusing on the interpretation of sacred texts and law. Since the main object is text, then hermeneutic closely associated with reading and therefore also to literacy [22].

The use of hermeneutics has grown from its roots in the interpretation of Greek classical literature [27]. Currently, hermeneutic also be used in making the interpretation of texts in other disciplines, for example in the field of Computer Science as being practiced in [23], [24], [25], and [26].

The key word in hermeneutics is interpretation, as stated in [28]. The main assumption is that every human being perceives herself and her situation in a special way, and that she applies meaning to everything that surrounds her [28]. This means science that aims to find out something about something involves interpreting the world and how it is perceived, not how it is [28].

Hermeneutics presents us with a way of exploring

meaning and interpretation that incorporates several key aspects: a relational approach to the text (information, event); the circular and evolutionary character of dialogical understanding; and the importance of prior understandings, which have a historical dimension and stress the contextuality of meaning from a pragmatic recognition of the world and our place in it with others [22].

Five characteristic of Hermeneutic are [29] : (a) seeks understanding rather than explanation; (b) acknowledges the situated location of interpretation; (c) recognizes the role of language and historicity in interpretation; (d) views inquiry as conversation; and (e) is comfortable with ambiguity.

Hermeneutic closely related to postmodernism. This is inline with what is expressed in [30], that the hermeneutic concept of the interpretive circle suggests that interpretation is an endless process while postmodern perspectives similarly emphasize the multiplicity and infinity of interpretations.

Ramadhan, Sensuse and Arymurthy has been revealed in [31], that one of the characteristics of postmodernism is all meaning is contextual and based on difference. That characteristic appear in the hermeneutic. As stated in [32], that a hermeneutic researcher approaches his research object with his own understanding as an advantage. The underlying problem is that every reader of a text has a different understanding of that text depending on his or her own experiences and life-world [33].

Other characteristic of postmodernism is the existence of social construct [31]. That characteristic also appear in hermeneutic.

In [31], it was argued that postmodernism can appear in e-Government system development process. Then, based on some of the explanations above, it is known that some characteristics of postmodernism is also present in hermeneutic. This suggests that the hermeneutic can also involved in e-Government system development process.

Hermeneutic interpretation performed with a fundamental principle called the hermeneutic circle [34]. In hermeneutic circle principle, interpretations made from a specific section ("part") and then moves to the common section ("whole"), then return from ("whole") toward ("part") [34]. This is done iteratively in order to get a thorough understanding [34].

Examples of the repeated interpretation process between whole and part as a hermeneutic circle can be found in [35], as shown in Fig. 3. The middle circle in Fig. 3 shows the hermeneutic interpretive process as alternating between interpretations of observations of community meetings (minutes of meetings and field notes), public documents (reports and website material disseminated by local authorities) and interviews (interview transcripts) [35].

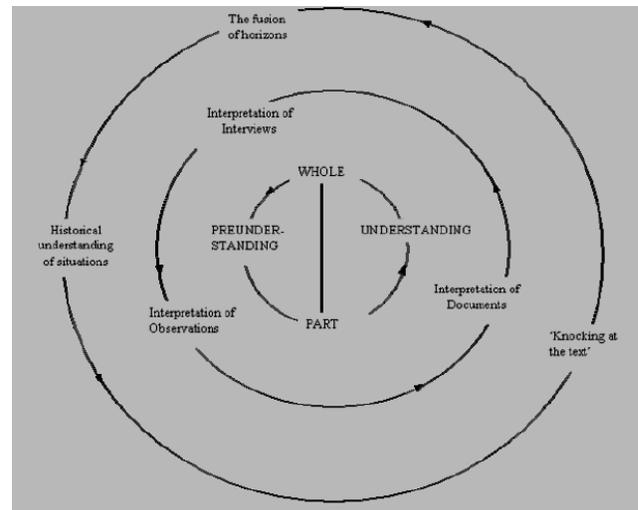


Figure. 3. Example of hermeneutic circle application [35].

The hermeneutic circle, therefore, allows the researcher to uncover in-depth and rich data [24]. The idea behind hermeneutic circle is that there is a circular relationship between the prior knowledge of a recipient of a text and his or her understanding of the same text [33]. By the hermeneutic circle, it means that hermeneutic can be done iteratively as implied in [26].

Hermeneutics has moved away from the idea of such a 'correct' understanding and has expanded into the art of understanding all communication, not just written text [33]. As revealed in [30], hermeneutic can also be used to observe the social practices. Hermeneutic can also be done to interpreting the meaning of experiences and symbolic artefacts (such as art or sculpture or architecture), which may be either historical or contemporary [36].

4. Where And How Hermeneutic Can Be Used in SSM

In the use of SSM, a developer of e-Government system can use the interview as one of his methods. The interviews can be done in the first step of SSM, i.e. the identification of a problem situation. Objects that can be

interviewed are the stakeholders of e-Government system that will be developed. The interview results are then written in the form of text-based transcripts.

In addition, to support the first step of SSM, a developer is sometimes necessary to collect some related documents. These documents can be in the form of law document, government agency's strategic plan document, current infrastructure condition document, and others. Again, these documents are of course in the form of text.

To support the process of developer understanding about some text-based resources above (i.e. the interview transcript or others document), and to uncover knowledge from them, then the developer can do hermeneutic. This is consistent with what is stated in [37] that hermeneutic primary concern is with the meaning of a text or text-analogue that can be (for example) a book, scholarly article, interview transcript, email, or organization.

Hermeneutic can be done using hermeneutic circle principle. Transcriptions of interview data were repeatedly searched for themes and ideas [38]. The study iterated between the fragments of interviews as parts and the global context [38].

Our suggestion is also supported by a statement that is stated in [39], that hermeneutic can be used to uncover knowledge. From hermeneutics we can learn that the process of producing knowledge has to do with the creation of texts and that the reception and development of texts are what constitutes knowledge [33]. Specifically, hermeneutic can be used to uncover the tacit knowledge as being implied in [40]. It is also revealed in [41], that hermeneutics were utilised because they enabled the understanding of the impact of meta-abilities on tacit knowledge externalisation and sharing from the text (text-analogue).

To facilitate the developer, currently hermeneutic can also be conducted computerized. One software example that can be used to do hermeneutic is NVIVO.

If the developers are also use the FGD method in the SSM, such as those proposed in [17], then the hermeneutic can also be performed. In the [17], it was argued that the FGD can be done in the second step and sixth step of SSM. The results of the FGD then being recorded or written in the narrative form by the moderators. In this case, hermeneutic can be performed on that narrative text.

From the above explanation it can be concluded that the hermeneutic can be used in the first step of SSM, i.e. the identification of a problem situation. In addition, if the

developer is also doing FGD as being proposed in [17], then the hermeneutic also can be done in the second step and sixth step of SSM.

5. Conclusions

Since there are a lot of aspect involved and there exist soft component in e-Government, then the e-Government system development process can be done using the Soft System Methodology (SSM), which is based on soft systems thinking. To uncover knowledge, then the hermeneutic can be used to enrich the SSM. Hermeneutic can be done using hermeneutic circle principle. The hermeneutic can be used in the first step, second step and sixth step of SSM.

References

- [1] R. Heeks, *Implementing and Managing eGovernment An International Text*, London, England : SAGE Publications, 2006.
- [2] D. M. West, *Digital Government Technology and Public Sector Performance*, New Jersey, USA : Princeton University Press, 2005.
- [3] D. Aronson. (1999). *Targeted Innovation Using Systems Thinking to Increase the Benefits of Innovation Efforts* [Online] Available: www.thinking.net/Systems_Thinking/st_innovation_990401.pdf.
- [4] A. Mirijamdotter, "A Multi-Modal Systems Extension to Soft System Methodology," Ph. D. dissertation, Lulea Tekniska Universitet, Sweden, 1998.
- [5] J. Gu and X. Tang, "Meta-Synthesis System Approach To Knowledge Science," *International Journal of Information Technology & Decision Making*, vol. 6, no. 3, pp. 559-572, 2007.
- [6] M. C. Jackson, *System Thinking Creative Holism for Managers*, John Wiley & Sons Ltd, England, 2003.
- [7] <http://systems.open.ac.uk/materials/T552/pages/rich/richAppendix.html>
- [8] P. Checkland, "Soft Systems Methodology: A Thirty Year Retrospective," *Systems Research and Behavioral Science*, vol. 17, pp. S11-S58, 2000.
- [9] J. Yang and Y. He, "An Application of Checkland's Soft System Methodology in China", in *Proceedings of IEEE International Conference on Systems, Man and Cybernetics*, IEEE Press, vol. 1, 1995, pp. 603-608.
- [10] Y. Jianmei and H. Zheng, "A Suggestion of SSM with Interest-Coordination Process", in *Proceedings of IEEE International Conference on Systems, Man, and Cybernetics*, IEEE Press, Vol. 3, 1996, pp. 2412-2416.
- [11] B. Lehane and R. J. Paul, "Soft System Methodology and Simulation Modelling", in *Proceedings of the 1996 Winter Simulation Conference*, IEEE Press, 1996, pp. 695-700.
- [12] H. G. Dirker et. al., "A Systems Thinking Approach to Manage Distribution Channels in the Control and Instrumentation Product Market with Multi-Faceted Product

- Lines,” in Proceedings of the 2008 IEEE ICMIT, IEEE Press, pp. 1389-1394.
- [13] B. Kang and J. L. Hu, “Research and Improvement of the Logistics System Based on Soft Systems Methodology,” in Proceedings of IEEE International Conference on Advanced Management Science (ICAMS), IEEE Press, vol. 1, pp. 117-120, 2010.
- [14] J. Biggam, “Exploiting Soft Systems Methodology (SSM) and Knowledge Types to Facilitate Knowledge Capture Issues in a Web Site Environment”, in Proceedings of the 35th Hawaii International Conference on System Sciences, IEEE Press, 2002.
- [15] Z. Yinghong, “Soft Systems Methodology Based on Decision Making Knowledge Integration,” in Proceedings of International Conference on Wireless Communications, Networking and Mobile Computing 2007 (WiCom 2007), IEEE Press, pp. 5733-5736, 2007.
- [16] S. Razali et. al., “Applying Soft System Methodology (SSM) into the Design Science: Conceptual Modeling of Community based E-museum (ComE) Framework,” in Proceedings of IEEE International Conference on Systems Man and Cybernetics (SMC), IEEE Press, pp. 2701-2707, 2010.
- [17] A. Ramadhan, D. I. Sensuse, and A. M. Arymurthy, “A proposed methodology to develop an e-Government system based on Soft Systems Methodology (SSM) and Focus Group Discussion (FGD),” in Proceedings of 2011 International Conference of Advanced Computer Science and Information Systems (ICACSIS), IEEE Xplore, 2011.
- [18] C. D. Pedron and A. Z. Saccol, “What Lies behind the Concept of Customer Relationship Management? Discussing the Essence of CRM through a Phenomenological Approach,” Brazilian Administration Review, vol. 6, no. 1, 2009, pp. 34-39.
- [19] J. Barojas, “Problem solving and writing II: The point of view of hermeneutics”, Lat. Am. J. Phys. Educ, Vol. 2, No. 1, 2008, pp. 6-14.
- [20] D. Hart, “Systemic Evaluation Methodology For Technology Supported Learning”, Ph.D. Dissertation, The University of Sheffield, 2010.
- [21] K. D. Peszynski, “Power and Politics in a System Implementation”, Ph.D. Dissertation, Deakin University, 2005.
- [22] R. T. O’Farrill, “Information Literacy and Knowledge Management: Preparations for an Arranged Marriage”, Libri, vol. 58, 2008, pp. 155–171.
- [23] S. R. B. Berdal, “Public deliberation on the Web: A Habermasian inquiry into online discourse”, Cand.Scient Thesis, University of Oslo, Oslo, Sweden, 2004.
- [24] J. K. B. Yeo, “An Investigation of Contextual Factors Influencing The Development of a Sustainable Knowledge Economy”, Ph. D Dissertation, The Pennsylvania State University, Pennsylvania, USA, 2007.
- [25] T. Butler and C. Murphy, “Understanding the design of information technologies for knowledge management in organizations: a pragmatic perspective”, Info System Journal, Vol. 17, 2007, pp. 143-163.
- [26] J. D. Warren, “TV in The Age of The Internet: Information Quality of Science Fiction TV Fansites”, Ph. D Dissertation, Indiana University, Indiana, USA, 2011.
- [27] C. von Zweck, M. Paterson, and W. Pentland, “The Use of Hermeneutics in a Mixed Methods Design”, The Qualitative Report, Vol. 13, No. 1, March 2008, pp. 116-134.
- [28] M. Runardotter, “Information Technology, Archives and Archivists – An Interacting Trinity for Long-term Digital Preservation”, Licentiate Thesis, Lulea University of Technology, 2007.
- [29] E. A. Kinsella, “Hermeneutics and Critical Hermeneutics: Exploring Possibilities Within the Art of Interpretation”, Forum: Qualitative Social Research, Vol. 7, No. 3, Art. 10, May 2006.
- [30] V. Mottier, “The Interpretive Turn: History, Memory, and Storage in Qualitative Research”, Forum: Qualitative Social Research, Vol. 6, No. 2, Art. 33, May 2005.
- [31] A. Ramadhan, D. I. Sensuse, and A. M. Arymurthy, “Postmodernism in e-Government”, IJCSI International Journal of Computer Science Issues, Vol. 8, Issue 4, No. 1, July 2011, pp. 623-629.
- [32] J. Jonsson, “Strategic understanding of a complex customer system A field experiment at UNOSAT”, Master’s Thesis in Informatics, Goteborg University, Sweden, 2004.
- [33] B. C. Stahl, Information Systems Critical perspectives, London, England : Taylor & Francis, 2008.
- [34] H. K. Klein and M. D. Myers, “Evaluating Interpretive Field Studies In Information Systems”, MIS Quarterly, Vol. 23, No. 1, 1999, pp. 67-94.
- [35] M. Arunachalam, “A Philosophical Hermeneutics Approach for Understanding Community Dialogue on Environmental Problems: A Case Study of Lake Taupo,” in Proceedings of The 5th European Conference on Research Methodology, pp. 31-39.
- [36] J. Gupta, “Potential factors influencing adoption of a Service Oriented Architecture: Experiences from specialist healthcare in Norway”, Master Thesis, University of Agder, 2008.
- [37] J. Fowler, P. Horan, and C. Cope, “How an “Imperative” IS Development was Saved from a Failing Course of Action – A Case Study”, Issues in Informing Science and Information Technology, Vol. 4, 2007, pp. 395-406.
- [38] T. Linden and J. L. Cybulski, “Application of Grounded Theory to Exploring Multimedia Design Practices,” in Proceedings of 7th Pacific Asia Conference on Information Systems, 2003, pp. 508-522.
- [39] H. Klaus, “Elements of a Hermeneutics of Knowledge in Government The Coalition of Public Sector Reform and Enterprise Resource Planning”, Ph.D. Dissertation, Queensland University of Technology, 2004.
- [40] P. Busch and D. Richards, “Graphically defining articulable tacit knowledge”, in Proceedings of Conferences in Research and Practice in Information Technology, Vol. 2. 2001.
- [41] M. H. Selamat, “Developing Individuals for Developing Learning-Based Systems”, Ph.D. Dissertation, Brunel University, 2005.
- [42] A. Ramadhan, D. I. Sensuse, A. M. Arymurthy, “e-Government Ethics : a Synergy of Computer Ethics, Information Ethics, and Cyber Ethics”, International Journal of Advanced Computer Science and Applications (IJACSA), Vol. 2, No. 8, 2011, pp. 82-86.

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