Structuring Risk in E-Government Development Projects Using a Causal Model

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Abstract:

E-Government (E-Gov) projects are increasingly being implemented worldwide. However, the risk management literature relating to E-Gov development projects is minimal compared with traditional Information System (IS) development projects. The success or failure of such projects depends on a number of obstacles to be overcome. Traditionally project actors use checklist, brainstorming, questionnaires, and workshop/focus-group to identify risk in IS development projects, and this research uses a similar approach applied in E-Gov development projects. This experiment investigates and attempts to use a causal core model known as CorMod to facilitate the applicability of applying a causal core model in a workshop/focus group environment to enhance the identification and analysis process of risk in the early stages of E-Gov development projects. The model/tool was based on the techniques of causal maps and has been used previously in three different traditional case studies of IS development projects with encouraging results. The model/tool combines different approaches such as brainstorming, questionnaires, and workshop/focus-groups. These methods have been used in IS traditional development projects, however, this research is concerned with their applicability within E-Gov development projects. One feature of CorMod is its ability to structure risk factors in development projects. This experiment, using CorMod, was conducted in the early stages of a large scale E-Gov development project based in Kuwait. The case study was conducted at a government agency within the government of Kuwait in charge on executing the national E-Gov program in the country. One main objective of this experiment is to improve the assessment of risk management approach in E-Gov development projects.

Keywords: *E-Government development project, Risk management, Causal maps*

1. Introduction

The globe is becoming a competitive business environment mainly due to the wide use of the Internet to conduct business. E-Government (E-Gov) is a term used to describe the electronic relationships of government to business (G2B) or government to citizen/customer (G2C) which are designed to improve efficiency, lower operating costs, and increase access to 24/7availability . Governments are setting budgets to achieve efficient E-Gov services through the development of projects and the monitoring of project outcomes to ensure they deliver expected benefits (Evangelidis, 2005).

However, E-Gov projects are vulnerable. Some data has identified the rates of success and failure in E-Gov development projects. One study on E-Gov cases in developed countries

revealed that 35% of the total cases were failures, 50% were partial failures and 15% were successful (Heeks, 2003).

1.1. Problem area

Many areas of E-Gov remain unexplored (Esteves and Joseph, 2008). One such area is E-Gov development risk management. Some research suggests using an analytical frame work to manage risk within the development cycle (Bannerman, 2008).

Some literature supports the use of certain approaches to identify risk in traditional information system development projects. These include diagrammatic techniques and brainstorming approaches (Bartelett, 2002). Other techniques include conducting workshop/focus-groups sessions (Fajtak, 2005) or using a set of questionnaires to investigate the degree of risk in the undergoing project (Dorofee, 1996). However, drawing a diagram to represent the project from scratch, preparing a set of questionnaires, or providing material for workshop/focus group could be labour-intensive.

In this research an attempt was made to apply a risk identification model to an on-going E- Gov development project based in Kuwait. The intention was to provide a tool that contained some beneficial features. This was a brainstorming tool to identify risk, by going through a set of questionnaires consisting of more than sixty questions in a workshop/focus group environment.

This paper discusses the use of a core model (CorMod) expressed as a causal map to identify risk in E-Gov development projects. The model (CorMod) had already been applied in traditional IT development projects. The research challenge was to investigate the applicability of the model in E-Gov development projects. Murse et al (2003) had suggested that there are risks inside and outside the project, and some in between. Risks inside the project are something project management can control, but management has no control of outside risks. Between the inside and the outside risks, there is a middle ground which project management have limited control of.

One concern about this research was that many IT development projects have fewer external stakeholders compared with E-Gov development projects which usually involve more external bodies (such as other government agencies) as stakeholders.

2. Risk and risk management

IEEE (2004, p. 3) describes risk as ‘the likelihood of an event, hazard, threat, or situation occurring and its undesirable consequences; a potential problem.’ Project Management Body of Knowledge® (PMBOK, 2004) addresses risk as ‘an uncertain event that could have a positive or negative effect on a project’. However, risk relating to the Internet is considered as ‘cyber risk’ according to Mceachern (2001).

Two types of risk exist today, development risk and operational risk. Development risk exists at the time of system development such as ‘unskilled developers’ (Al-Shehab, 2007). Further, Operational risk occurs after the deployment of the system when it becomes operational, for example, virus attack or hardware failure.

This research focuses on examining development risk that could exist from the initiating point of the project until it is accepted.

Within the area of E-Gov risk management, little research has addressed the risk involved in E-Gov adaptation projects (Rotchanakitumnuai, 2007). Because E-Gov projects are of broader nature compared with traditional IS projects, this might imply that risks could be wider-ranging(Evangelidis, 2005)

2.1. Approaches for identifying risk

Perhaps one of the most important and essential step in risk management process is risk identification step (Wat et al, 2005, Al-Shehab, 2007). Two key techniques can be applied here.

Checklist: is a comprehensive list of the risks that could occur in a project (Keil et al, 2006). The checklist includes generic risk items along with a brief description of each to make practitioners aware of how each risk item might apply to the undergoing project (Keil et al,

2006). Checklists relating to E-Gov projects were identified in the literature (Rotchanakitumnuai, 2007). However, one limitation to a risk taxonomy expressed as a list is the lack of any visible cause-and-effect structure (Al-Shehab, 2007). Descriptions of existing diagrammatic techniques which can convey such structures are presented in the next section.

Brainstorming: Another way of identifying risk is the brainstorming approach (Bartlett 2002, Dorofee et al 1996). This approach could be more useful than the checklist approach because it can raise more risks associated with the undergoing project (Al-Shehab, 2007).

3. Causal maps and CorMod

Diagrammatic techniques are available in the literature, for example, concept maps (Novak and Canas, 2006), mental maps (Buzan, 2003), causal maps (Ackermann and Eden, 2005), reasoning maps (Montibeller et al., 2007). Causal maps were chosen to support risk factor identification in cause-effect mechanism.

CorMod development used the techniques of causal maps and was build upon the available literature and three case studies (Al-Shehab, 2007). CorMod had already been evaluated with traditional IT development projects based in Kuwait. The projects included one in an educational sector, one in a telecommunication company, and one in a software house. The applicability of CorMod to the three projects had been encouraging. However, in this research CorMod was to be extended to be applied to an on-going E-Gov development project.

4. Workshop/Case study

4.1. Case study

E-Gov readiness is determined not just by government initiatives aimed at making comprehensive government services available online to citizens, but also the level of acceptance and participation of the society in e-services. The United Nations Global E-Government Readiness Report 2005 (UN, 2005), placed Kuwait at number 75th in the world in terms of E-Gov readiness; moving up from number 100 in 2004. Since then Kuwait is striving towards a focused E-Gov development.

The vision for an E-Gov in Kuwait involves integrating the various government agencies in a single wide-area network (WAN), at the same time making sure that the internal systems of the various government agencies are accessible via the Internet. Kuwait is about half way through its E-Gov project, which is planned to produce online version of all basic public services in 2010.

Next is a description of the case study project.

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> *The project is based in Kuwait, at a newly established IT government body, known as CAIT (Central Agency for IT), responsible for executing a novel E-Gov project that never been done in the country. The project is to develop a government portal for Kuwait with a budget of $1.7M. The project handover is scheduled to be effective after one year. At the same time, CAIT is going through an organizational restructuring process to support its newly established body. At the time of this research, three months have already passed by.*
>
> *The plan is to link all E-Gov services, from different government bodies (about 60 external different sits), into one main portal (providing G2C and G2B capabilities). CAIT have recruited some IT experts from other government bodies to start the project and to help in the establishment work for the new CAIT. The project is considered to be as phase one with other future phases planned for development to enhance the portal with more features such as, E-Payment, and nation-wide authentication initiative.*

4.2. Experiment design

The experiment tends to use CorMod as an analytical framework for risk management in the undergoing E-Gov project. The participants in the focus group will use CorMod as an aid to

identify and analyse risk factors that could exists in the under going project. The analysis task is derived by examining the relations between risk areas in CorMod.

CorMod consists of ten risk areas. The ten risk areas were based on a body of knowledge (Turner and Jenkins, 1996) taxonomy and case studies. These risk areas were evaluated in the literature for more validation. Further, checklists were used to evaluate the risk areas existence in the literature (Tiwana and Keil, 2004).

CorMod is intended to be used in a workshop environment by a group of participants in the undergoing E-Gov project. One of the research aim is investigating how CorMod could aid the participants in identifying, analysing the risk involved in the project.

This experiment is part of a research using a longitudinal case study method (see section 7.0 for details) based on taking and documenting two snapshots of the undergoing project over a period of few/several months (6-7 months apart). The first snapshot has been documented during the third month of the project and the second snapshot is intended to be documented during the last stages of the project development cycle.

This experiment is considered as the first snapshot of the longitudinal case study. The documentation of this research was done in a workshop environment over a period of less than four hours. During the workshop an introduction over risk, risk management, and causal maps was presented.

4.3. Conducting the experiment

The workshop included six participants and was conducted at the premises of CAIT. The participants hold different background (managerial and technical). At the time of the workshop, The participants' knowledge of risk management approaches did not include any type of visual structure of risk.

Some of the participants were involved in the daily activities of development as team leaders, while others were involved on a weekly bases at the level of the project's steering committee with technical and managerial background. Due to the participants involvement in the project the workshop allowed the participants to play two roles, playing the role of stakeholders, and playing the role of development team lead. Prior to the experiment, the facilitator conducted interviews with the participants to gain more familiarity of the targeted E-Gov development project. High level points were discussed and raised to gain more knowledge towards the project. These points covered areas such as overall objectives of the project, scheduled time plan, target users/customers, SW/HW requirements.

Later in the workshop, the main risk areas in the project were introduced according to CorMod representation (Figure 1). An explanation of each concept was also presented. The participants had full agreement over the presence of all risk areas as shown in Figure 1 in the undergoing project.

The participants were asked to investigate the existence of each concept and to validate each causal relation (direction and polarity) in CorMod.

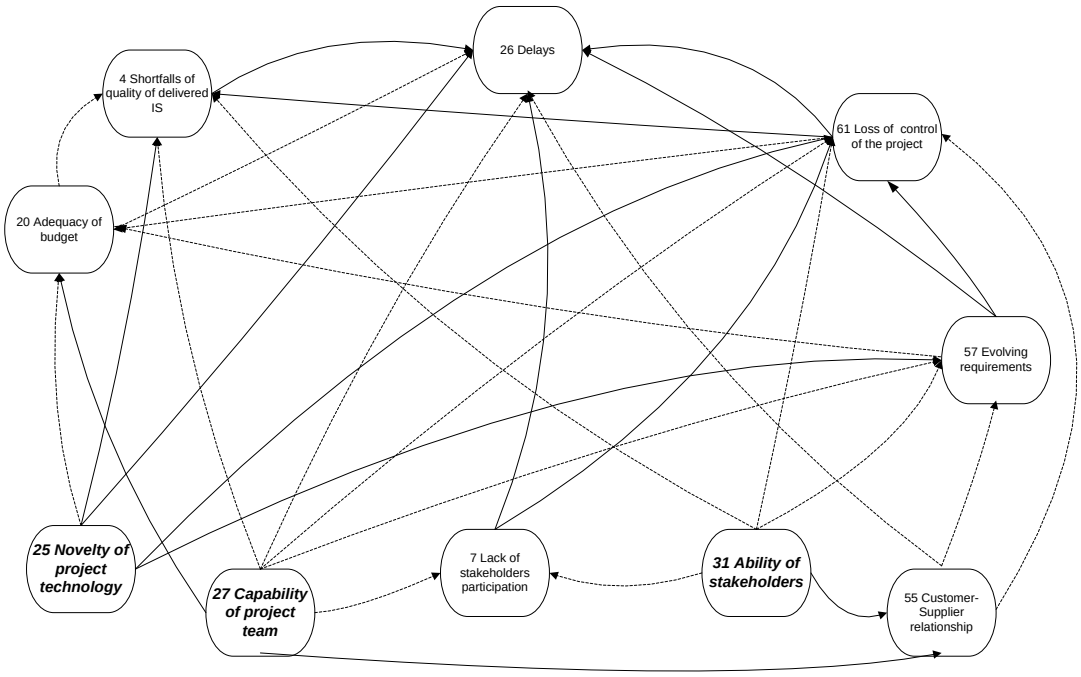

Figure 1: CorMod: Doted lines imply a negative link, and solid lines imply a positive link.

During the workshop, the participants examined a set of 30 open questions investigating the relation between each connected concept. The process of answering the questions, assisted the participants to express their perception based on their experience in the undergoing project. For example, the link between concept 55 and concept 57 was expressed in a question format as “Does customer-supplier relations have an impact on evolving requirements? How?”. The thirty questions were asked during the workshop to capture the different believes of the participants in order to reach a common understanding the project.

Upon participants discussion over concepts and their causal relations, a measurement was produced to rate each link in CorMod based on Expectation Index (EI). EI is a qualitative scale used to measure the perception of experts’ judgment in a situation (Al-Shehab, 2007). Later, the participants provided qualitative data relating to the measurement CorMod tail concepts numbers 25, 27 and 31 by rating the sub tails as was explained in Section 3.2 (CorMod). For example, concept 27 'Capability of project team' is measured by a set of questions discussed and agreed by the focus group. These questions relates to skills, experience, productivities.

4.4. Experiment outcome

At the start of the workshop, participants were introduced to the concept of risk, risk management, and the mechanism of causal maps. The participants were then introduced to CorMod and how it could be applied to the current E-Gov development project. One observation was, as soon as the CorMod was shown, it had a clear visual impact on the participants; reporting that they could observe how CorMod structured the project risks factors/areas and provided a visualizing effect that showed how risk areas interrelated with each other. The participants took sometime to understand what exactly each concepts/label meant. A brief description expressing each concept was handed out to the participants.

The workshop participants were in full agreement with the presentation of links/directions and polarity which were collected during the experiment. This finding goes in context with similar results from applying CorMod to previous three real/live case studies (Al-Shehab, 2007). The participants were triggered by CorMod relations structure to provide examples from their experience in past development projects and their knowledge of the undergoing project.

During the workshop, participants were enthusiast/interested about how CorMod structured risk areas in the project. Participants were able to relate to the structure of risk rather than the risk

itself as an independent entity. It enabled the participants to identify/vision risk areas and their impact over the success/failure of the project.

The participants rated the input to CorMod according to their perceptions within the context of the new E-Gov project. Face-to-face communication and collaboration was noticeably improved with the existence of CorMod by means of providing a clear visual structure that aided the participants to reach a common understanding and results (see Figure 3). The input to the sub tail was based on the sub factors that were explained in Section 4.2. For example the sub tails for concept 31 is explained in Figure 2.

The workshop stimulated a constructive discussion that made the participants gain more in-depth understanding of the project.

The participants were aware of issues associated with the 'organizational restructuring'. The participants revealed that this organizational issue have some affect on the 'Ability of stakeholders' and the 'Capability of project team' thus affecting the productivity of both teams. Participants agreed that there are two affects resulting from concepts 27 and 31, both internal and external to the project.

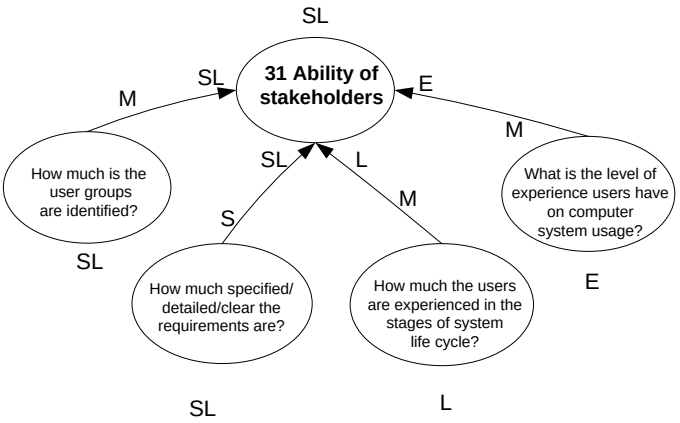

Figure 2: Sub tails to concept 31.

The participants have understood the diagram shown in Figure 1 and applied it to the undergoing project. The process of analysing each risk area and its relations to other risk area of CorMod triggered the identification of new risk areas and their effects over other risk areas of CorMod. Each sub tail of concept 31 and 27 was rated. The rating of the sub tails showed a final outcome of 'slight delay' of the project delivery based on the perception of the participants as shown in Figure 3.

User groups and stakeholders have been identified; however, participants raised the issue/concern relating to external government bodies' poor participation and involvement in the project. That is, for some external stakeholders the communication has not been well established so far and CAIT has no control over external stakeholders. Some reason behind this poor participation could be:

- some political issues involved
- and or lack of interest in the project.

This could represent a new risk factor in E-Gov development project which is '*lack of control over external stakeholder'*. The current situation in the undergoing project supports this finding.

The final outcome of CorMod suggested that this E-Gov development project could face slight delay in its schedule. However, this outcome is not the main objective of CorMod; it is walking through the model and debating among other project members the existence of risk factors and how it could affect the undergoing project. This exercise could raise the awareness level of the importance of risk assessment throughout the development cycle of E-Gov projects.

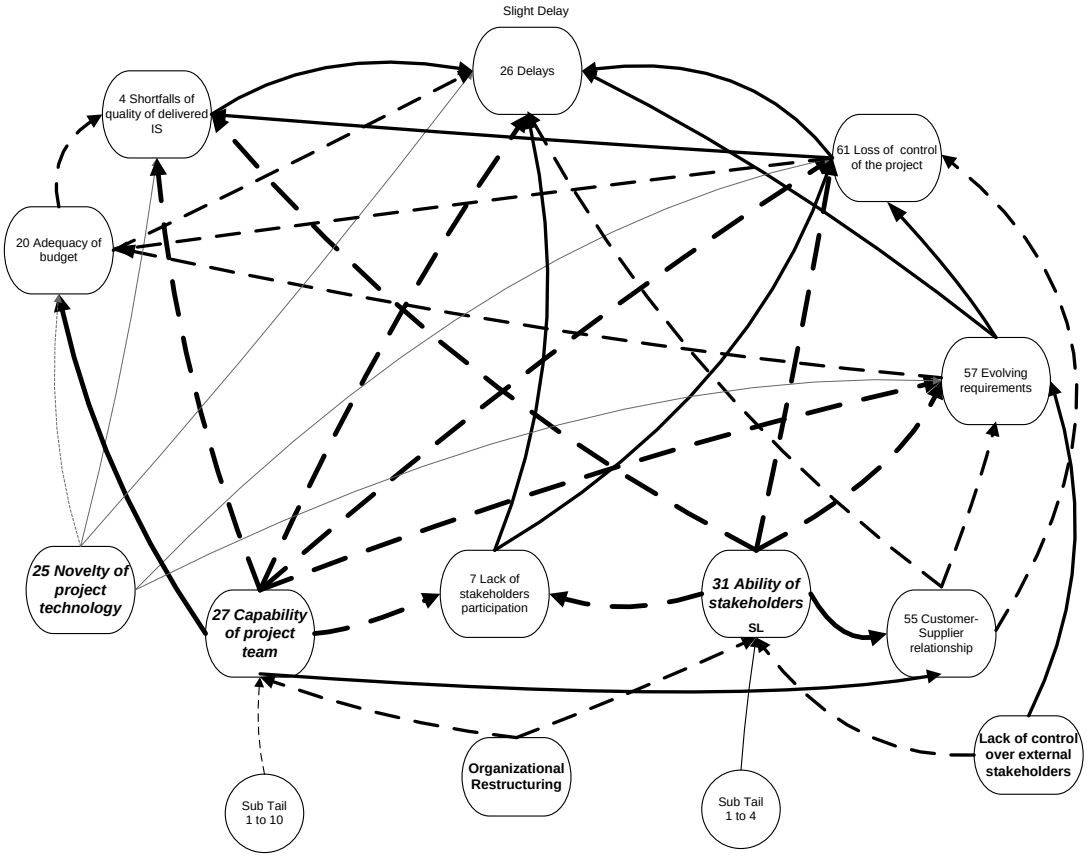

Figure 3: E-Gov workshop final outcome

One more observation is the importance of providing equal opportunities for all participants to voice their opinions and concerns by having a balanced control of the workshop session (Klein et al, 2008) provided by the facilitator.

5. Discussion

Conducting risk identification workshop is one way of identifying risk through group sessions that could provide some input through the expertise of the members (Bartlett, 2002). However, not much been explained about the method to be used for conducting such identification workshops.

This paper describes how a core model (CorMod) could be used to facilitate a number of approaches in risk management (explained next).

5.1. Brainstorming

Furthermore, we argue that CorMod could be used as a tool to facilitate group sessions with a brainstorming approach to identify new risks. For example, participants discussed sub factors leading to the IS Quality are:

a) Security: viruses, intruders, sabotage etc;

b) Usability: GUI, user friendliness;

c) Performance: is the response time for performing transactions which include accessing of information.

These sub factors are the main contributors to the quality of IS delivered system according to the perception of the participants. The model worked as a brainstorming tool by identifying new concepts and by presenting its analytical affects.

CorMod was used as a brainstorming tool where the different cause-effect relations of different concepts stimulated an amount of discussion that generated a new concept (4 Organizational Restructuring) that was not included in CorMod before. The participants examined all CorMod concepts and sub concepts. This investigating process is equivalent to going through a risk factor checklist to expand the vision and thinking of the current project.

5.2. Questionnaire approach

The model provided some qualitative measures to investigate the impact of each of its concepts (link measurements of weak, moderate, or strong). This was based on 60 questionnaire to evaluate the existence of concepts.

5.3. Workshop/focus group

The duration of the workshop was more than three hours, during which the participants were able to understand how CorMod works and interact with it constructively. We argue that walking through the model, as was explained in Section 4.2, could provide some content and material to support the process of conducting risk identification workshop. The model was used in a workshop environment that stimulated/triggered participants' discussion and face-to-face communication. CorMod provided a common visual ground for supporting workshop/group sessions by discussing the different relations in CorMod and applying or matching them with the current undergoing project.

5.4. Evolving ability of the model

One added feature of CorMod is the ability to evolve according to the perception of participants in the undergoing project. This feature supports the fact that every project is unique by itself and therefore, can produce new additional concepts and new links that can be added to CorMod.

5.5. Visual structuring of risk factors

Providing structure to risk factors makes a difference. The structuring of risk is a major observation in this research that could be one feature of CorMod. Risk factors taxonomies lists tend to lack any visible structure (Al-Shehab, 2007) and they do not show any interrelations between risk factors and considered as independent elements (Williams, 2000). Therefore, structuring risk factors is an essential aspect of risk analysis process.

The participants agreed that CorMod visual diagram led them to reach a general agreement about their perception of the project. Participants from different (management, technical) backgrounds did reach one common ground of communication and understanding. The visual structuring feature in CorMod had a clear impact in addressing the representation of risk factors/areas and their dependency relations.

The final outcome resulted as 'slight delay' in the project according to CorMod. However, this is not the main objective of CorMod. The main objective is to simplify the process of identifying risks in the project by providing a high level visual diagram. This was done by walking through CorMod and using the features of brainstorming, going through risk list, and applying CorMod in a workshop environment.

The participants revealed that In Kuwait, it is a fact/tendency that there is a lack of consideration to the importance of risk management and its role in identifying and rectifying problem areas found in IT projects sponsored by the public/government sector. However, in this workshop, the participants acknowledged that this was 'an eye-opening exercise' to the importance of practicing risk management.

One observation was noted 'the lack of control over external stakeholders.' This description of risk in this specific project could be seen as uncertainty of involvement and participation of external stakeholders which is needed to complete the development of the project. One would expect less control over external stakeholders compared with internal stakeholders. This could

imply that risk in E-Gov projects could exist in an external source to the executing body. One reason is due to having more external stakeholders involved in the project, i.e. different government bodies, rather than what is found usually in wide range of traditional IT development projects which mainly involve internal bodies.

6. Conclusion

The participants of this experiment had no previous experience nor knowledge in using any type of diagrammatic techniques, however, the participants understood the concept of causal maps and how CorMod behave in terms of cause-effect in a single workshop.

The research suggests that this type of workshop/focus group should be conducted on periodical bases during the project life cycle as a continuous process. However, in order to get more consistent and in depth perception of the project individual groups should be targeted (technical staff, management, etc.) and encouraged to participate in such workshops.

It is also suggested that the use of workshop/focus group sessions is essential to identify risk factors and to reach one common ground of understanding of the undergoing project in E-Gov development projects. We suggest using risk identification workshop for E-Gov development projects as well as for traditional IT development projects.

Visual structuring of risk is essential in identifying and understanding problem areas in E-Gov projects. Structuring of risk using visual diagrams (i.e. CorMod) is also valuable in risk identification approaches.

7. Further research

CorMod lacks the ability to quantify risk exposure, however, it is not intended that CorMod have a built in feature of this nature. One main objective of CorMod is to investigate different scenarios of cause-effects relations among different risk areas in the project. This workshop/focus group discussion led to identifying deficient areas in the project.

This finding suggests conducting more research on categorizing risks according to their sources. For example, there are risks coming from external sources, i.e. ‘lack of control over external stakeholders’.

It was observed during the workshop that breakdown of each concept could make it easier to understand the meaning of each concept. Breaking down each concept in CorMod could mean developing a second level (layer) of interrelated sub factors thus, producing a more detailed map. These sub factors could present questions that contribute to each concept, for example, how experienced are the developers when measuring the ability of project team. Another point is presenting more sub factors than what is available in the literature to breakdown the concepts, for example, IS quality could be broken down to security and performance of the system.

Questionnaires are one approach for identifying risk in IS/E-Gov development projects. Questions based on links in CorMod could be examined against the literature to refine and/or develop a set of questionnaires. One source of knowledge that was found in the literature is by Dorofee et al (1996) which contained a taxonomy-based questionnaires.

Validating causal maps could be a time consuming process. CorMod has been developed (Al-Shehab et al, 2006) and (Al-Shehab et al, 2005) to support the documentation and computations functionalities of both quantitative and qualitative approaches. The tool could be developed further to support sub concepts visual structuring for each concept.

Wang and Zhao (2005) argue those project members’ expectation changes over the project life cycle. However, it is not explained how to compare these expectations over time nor how to measure them.

This research has been designed as a longitudinal case study with two snap shots of the project intended to be taken to capture participants’ perception over time. Snap shot one was captured in this research, and snap shot two is intended in the near future. Some research questions need to be explored during the act of this task:

a) To what extent did the model enhance the experience of practicing risk management in E-Gov development projects?

b) Does the perception of stakeholders change over time during the life cycle of the project? And how?

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