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An Exploratory Study of IT Risk Management Implementation

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Full research paper

Abstract

This paper presents an exploratory study of IT risk management implementation with a focus on process and individual IT culture. This qualitative study adopts a subjectivist epistemology, complemented by an interpretive paradigm and inductive reasoning. A series of three case studies were designed around twenty-seven semi-structured in-depth interviews and were conducted to investigate how and why IT individuals implemented a risk management framework within an IT department. The findings suggest a dynamic approach to implementing IT risk management frameworks — one that considers the interaction over time of intentions, context, process, and action. The research develops a substantive theory involving a schematic model comprised of four sub-process and a set of theoretical propositions. The last section presents an evaluation of the resulting theory by following the guidelines introduced by Sjøberg et al. (2008) for building behavioural theories in software engineering.

Keywords IT Risk Management, Process Research, IT Individual Culture, IS Implementation, Interpretive Research.

1. Introduction

Information Systems (IS) research has argued that the successful implementation of IT risk management (ITRM) remains a critical challenge for many organisations (Pearce 2019) thus, much can be learnt from studies of successful implementations of IS (Sykes 2020). This paper argues that most research in IS implementation field has been influenced by a dominant variance perspective involving quantitative methods identifying factors to understand correlations between variables and a specific outcome (Öbrand et al. 2019, Rivard et al. 2011, Wiesche et al. 2015). While this perspective may identify some of the key factors, it does not examine the dynamic set of contextual conditions that interact with one another over time leading to a successful implementation. What needs to be researched is the interplay of factors and contextual conditions by which IT individuals come to be involved with ITRM, and that process research and methods that track activities over time are needed to fill this gap.

Additionally, prior studies have demonstrated comprehensive insights into how an ITRM process can be embedded into organisational structures and processes (Vance et al. 2020). These authors point out a gradual acculturation process through which organisational groups can socially construct the meanings and purposes of their work activities. These culture-ITRM studies highlight how IT departments deal with the implementation process in their workplace. Unfortunately, many of the behaviours and reactions of groups may lead to an unsuccessful implementation (Vance et al. 2020).

Interpretations of culture at an individual level are based on a process of participation that an IT individual adopts towards the implementation of ITRM, which are different from cultural dispositions towards an IT artefact at national, organisational and sub-group levels (Walsh 2014). Walsh (2014) additionally points out that IT artefacts should not be considered as "black boxes" with predefined roles but play interdependent and unstable roles during implementation. The IT artefact role is facilitated by the values embedded within them. For example, if an ITRM framework was designed to accurate identify and control IT risk, values such as risk optimization, efficiency and reliability need to be embedded into this IT artefact for individuals to perceive the value of applying the IT artefact (Vance et al. 2020).

This study argues that to understand the process by which individuals come to participate in ITRM implementations, an interpretivist perspective of how individual IT culture and the values embedded in an ITRM framework can be aligned is required. At the outset, two key terms need explaining and clarifying. *Values* are basic and fundamental beliefs that guide or motivate attitudes or actions. They help us to determine what is important to us. *Culture* on-the-other-hand is the totality of socially transmitted behaviour patterns, attitudes, values and beliefs, and it is these predominating values and behaviours that characterize the functioning of an individual, group or organisation (Webster). Thus, this study uses the term culture synonymously with values, as values are attributes of culture.

The objective of this study is to explore, describe, and explain how a successful ITRM implementation takes place – the process, and to investigate how and why the pieces of the implementation "puzzle" work together to produce a successful outcome. In this regard, this research steps outside the conventional factor analytic perspective of RM research by focusing on contextual and processual elements as well as the actions and interpretations of IT individuals to explain a successful implementation. In pursuit of the above objective, the outcome focus of this study is aimed at theory building for describing and explaining the implementation process. The questions guiding this research are: RQ1. What critical elements influence the implementation process? RQ2. What are the key steps involved in the process of implementation? And RQ3. How can these steps be depicted in a model?

2. Theoretical foundation

2.1 The Concept of Individual IT Culture

Prior studies have conceptualised individual culture with different perspectives. Straub et al. (2002) indicated individual culture with two paradigms, social identity theory and the virtual onion model. They demonstrated that an individual belongs to many subcultures as layers of the virtual onion, having a dependence to various social groups at the organisational, national, and professional levels. Conceptualisation of individual culture by Straub et al.'s (2002) rely on an interpretivist perspective. This perspective suggest that culture should be considered at multiple levels, in contrast to Schein's (1985) functionalist perspective which presumes culture can be managed in an integrative way. Further, Martin (2002) pointed out that concept of culture is complex and multifaceted inherently, so should be considered from the perspectives of integration, differentiation and fragmentation. The differentiation perspective interpreted by Martin's (2002) indicated that individual cultural attributes are a unique combination of group values that are interpreted based on individual's needs and motivations (Walsh,

2014). Hence, the differentiation perspective and social identity theory of culture provide that culture at the individual level is closely linked to individual's needs and motivations.

The literature also illustrates that individual needs and motivations can lead to create various culture archetypes (Vance et al. 2020). For example, ITGI (2008) identified different IT culture architypes in the context of ITRM: risk-aware, knowledge sharing, security and continual improvement, supportive and blame cultures. It also explained that the IT culture archetypes changed or shifted over time, thus, these interactions can lead to one archetype inhabiting the other and becoming the dominant archetype. Hence, such a "culture creep" points to a dynamic and interacting implication of IT culture archetypes (Pearce 2019; Walsh 2014). Hence, these contextual factors would influence enculturation processes such as individual and group socialisation, knowledge-set attainment, and leadership. Leidner and Kayworth (2006) interpreted an IT culture as consisting of IT values, the specific values a person attributes to IT. To understand these IT values and assumptions will provide deeper insights into how individuals perceive IT risks and eventually respond to them. This research represents that individual culture differs from values shared by an organisational group, despite having a shared culture may have different individual interpretations about ITRM frameworks. Hence, this research focuses on understanding individual's values, interpretations and assumptions, which would be different from organisational dominant culture, influence ITRM implementation process. The next section of the paper develops the IT artefact and the impact values embedded in them.

2.2 ITRM Frameworks as IT Artefacts

Prior studies have identified frameworks such as COBIT as tools for increasing realising benefits, optimising resource and optimising risk (De Haes et al. 2013). The ISO 31000 RM standard describes the RM process as a cyclic process of learning involving six major components: communication, risk assessment, risk treatment, monitoring, and recording (ITGI 2008). It is noted that the process as defined in ISO 31000 is fully covered by the various processes and practices of the COBIT for Risk process (ITGI 2008). The COBIT suits of manuals also considers culture as a key enabler to help shape individual's intentions for achieving the effectiveness of ITRM. From an interpretivist view, De Haes et al. (2013) noticed that IT artefacts are not only practical tools, but provide two-way interactions among individuals and IT artefacts. This perspective is in contrast to Davis's (1989) functionalist perspective which assumes individuals' or organisations' interactions with the IT artefact are separate, and that the various groups are independent of each other. This research considers each interaction an individual has with an IT artefact as the basic unit of analysis that determines behaviours and reactions, rather than considering the IT artefact as a static bundle of features. Pearce (2019) suggested that an IT artefact should not just be considered to perform tasks technically and that it ought to clearly symbolise particular important values. This study does not assume that different individuals identified and responded to ITRM implementation in the same way or in a stable manner. It assumes that ITRM should be embedded within structures, thereby highlights that IT artefacts are not just practical tools, but afford two-way interactions among individuals and IT artefacts to enable social presence.

2.3 IT Risk Management Implementation

ITRM implementation studies are concerned with understanding how successful ITRM will be achieved when implemented into an organisation's existing organisational processes. Previous studies have identified different factors of successful IS implementations or failures (Sykes 2020) and have also presented long lists of critical success factors necessary to avoid ITRM implementation failure. In many cases, ITRM implementation failure occurs due to perceived threats to individuals such as control, power loss, and distrust (Rivard et al. 2011). This challenge is because of different groups that hold different values and act towards ITRM. Some groups may find that implementing an ITRM satisfies some of their needs and are therefore motivated to development it, while the contrary may be true for groups whose ITRM needs are not met and even may consider threats to their job security.

Understanding of individuals' acts and reactions during ITRM implementation highlights the important role culture during ITRM implementations. Vance et al. (2020) suggested that culture theory can demonstrate how and why cultural forces influence social groups' acts and reactions towards implementations at a national level, organisational level and at the subgroup level. While these different levels of cultural analysis could be provided valuable and comprehensive insights, less attention has been given to studying how culture at an individual level can influence implementations.

It is argued in this study, the process by which IT departments come to participate in ITRM schemes whin IT departments, remains poorly understood. None-the-less some of the key factors influencing implementation have been researched and are well documented. However, what is not well researched or known are the dynamic processes comprised of intervening factors that may change over time; and

how these factors and processes are depicted in a model. In particularly, what is not well researched or known are how these factors and contextual conditional work together over time to ensure a successful ITRM implementation. This paper argues, process research and methods that track activities over time are needed to fill this gap. This study conceptualises ITRM implementation as a cultural process through which IT managers socially construct the meanings and purposes of their work activities. The next section of the paper further develops these arguments through a qualitative multi-case study, exploring the relationship between individual IT culture and the values integrated into an IT artefact during ITRM implementation process.

3. Research Method

3.1 Process Research

Mohr (1982) suggests that two fundamentally different types of theoretical approaches can be used to investigate organisational phenomena: variance and process models. The distinction in theoretical structure between variance and process models are somewhat analogous to the distinction between cross-sectional and longitudinal research methodologies. While variance models focus on correlations between groups of variables and a specific outcome, process models aim to understand the sequence of events leading to some result over time (Burton-Jones et al. 2015).

The unit of analysis of process thinking research is the ITRM implementation process itself. This study posits that most of previous studies about ITRM tend to identify successful implementations through identifying critical success factors but have overlooked how these factors evolve and interact over time to implement an ITRM successfully. This paper also assumes that the implementation process and perceived meaning of ITRM are not objective phenomena with known properties or dimensions. The research approach, accordingly, is consistent and compatible with the epistemological assumption that is, experience of the world is subjective and best understood in terms of individuals' subjective meanings rather than the objective definitions. Thus, the paper proposes a method capable of capturing social meanings of participation, as generated by managers- *an interpretive case study*.

3.2 Research Strategy

We interviewed IT individuals at organisations named as company A, B, and C who were either responsible for IT departments or participated in the risk management process and could therefore provide thorough insights on the perception of ITRM within their organization.

The organisations selected were those with a long history of actively engaging in managing IT risks and for whom ITRM is a long-standing and ongoing challenge. (A) Consulting: IT risks centre on issues of organizing supply chains, information visibility and privacy. Case A is one of the pioneering and most reputed engineering and project management companies, a first implemented an ITRM 10 years ago. (B) Serving: automation, product data management and retail networks induce IT risks. Case B is an EPCC contractor which is active in the oil, gas, energy and petrochemical sector. It does not have to comply with ITRM regulations, but started implementing an ITRM process 3 years ago.

After interviewing practitioners from Cases A and B, we developed an initial understanding of the ITRM process. In particular, we were concerned with the many different interpretations to implement ITRM process at A and B. Therefore, we specifically looked for an organization with the potential to contrast our initial understanding of the ITRM process. This led us to Case C where we conducted a second cycle of interviews to substantiate our initial theoretical understanding. (C) Banking: long-standing IT risks result from regulatory compliance, financial fraud and outsourcing. Case C is a large-sized IT service provider for the banking industry and provides banking applications, IT services, IT infrastructure and IT training for several hundred customers. It started implementing an ITRM process 12 years ago.

3.3 Data Collection

Our data set comprises 27 semi-structured interviews with 10 practitioners from Case A, 9 from Case B, and 8 from Case C. The interviewees were iteratively chosen based on their role within the organization. In all three organizations, we interviewed the Heads of IT, Senior IT management, IT operations, and other ITRM experts who had been involved in the ITRM implementation process. We asked questions on the ITRM process and recorded and transcribed the interviews. Due to confidentiality reasons, we were not allowed to record seven interviews, so we took notes during the interview instead. However, in all interviews we observed that interview partners told us insightful aspects of their work “off the record” and we included these insights in our notes.

3.4 Data Analysis

Analysing data is the heart of building theory from case studies, but it is both the most difficult and least codified part of the process. Inspired by the work of Miles and Huberman (1994) for data presentation and Strauss and Corbin (1997) for an application of grounded theorising (GT), the approach to data analysis included three steps: 1. early steps in analysis include use of a contact summary form for reviewing the interview, the arranging of data in tables, and the development of a coding scheme. 2. Within case steps involved detailed write-ups for each case assisted by the identification of critical incidents, a time line displaying stages of the process, the development of a logical chain of evidence, and the writing of a narrative story. 3. Cross case analysis involved the search for cross-case patterns by combining information from several cases into a single table. From that, a new set of process-oriented codes were developed, using a form of content analysis known as 'open coding' and 'axial coding'.

4. Findings

This study conceptualises IT culture at the individual level based on the complexity of individuals' actions and behaviours towards implementation. The study analysed the key elements to build a model based on IT individuals' needs, motivations, beliefs and perceptions as IT individuals and their manager's combined work practices to achieve a successful ITRM implementation.

4.1 Identified Elements to ITRM Implementation

RQ1. What critical elements influence the implementation process?

The degree of prominence was determined by considering individual actions and behaviours. People's indications of similar attitudes towards ITRM having a critical impact on the ITRM implementation were coded as prominent. Within and across the interviews, we found different but important types of immediate responses to ITRM. Given that they each illustrated a different attitude towards ITRM, we labelled these responses as representative of four different categories: *'organisational and management elements', 'individual elements', 'organisational capability elements'* and *'technical elements'*.

An important aspect influencing successful ITRM implementation are organisational and management elements. We identified a range of these elements that influenced individual attitudes towards participation in the implementation of ITRM within IT departments. The two most salient elements were: '*commitment and support of IT managers'* and *'allocating specific responsibility'*.

The most influential of organisational and management element is labelled commitment and support of an IT manager. As commented by Case A, IT managers are considered as valuable advisors who enhance organizational responsiveness.

> *"IT managers provide guidance and monitor the quality of ITRM conducted by members. They embed the process within organisation and are responsible of ensuring participation of members in this process. (Senior IT management, Case A)".*

A further salient practice pointed for *allocating specific responsibility* for implementing ITRM. An ITRM scheme does not just implement itself – we need to establish a team or allocate a specific person. Different people within IT departments should be given responsibility for implementing different parts of the scheme. It should be clear to everyone who is responsible for each aspect of implementing the ITRM scheme. A comment by head of IT group in Case B was typical of respondent's remarks and emphasised selecting a person responsible for implementation:

> *"…… I believe staff members generally have a better knowledge of the day-to-day functioning of the organisation than do management. The management members prefer to do the legal and ethical responsibility for implementing……. allocating someone to implement systems who will always be responsible for that task…. (Head of IT group, Case B)".*

Thus, the requirements for qualified staff, combined with training for implementing ITRM was associated with having a supportive IT manager during implementation.

A further important aspect influencing successful of ITRM implementation are *individual elements*. We could understand a range of these practices elements that influenced individual attitudes towards participating in implementation including: *'level of trust', 'decision-making power', 'incentive'* and '*communication'*.

Over the last several years, trust has become a central subject of study in organisations. This study defines trust system as reliability of framework and indispensability of scheme. It is impossible to

participate in ITRM implementation without conceiving of trust among individuals. People must be assured that other individuals do not abuse their knowledge, knowledge sources are reliable, however the improvement of trust within organisations lead to encourage individuals to voluntarily share knowledge and ideas and participate readily and willingly.

> *"There was an issue here and that's the individual think about possible consequences when submitting an idea…….I believe the RM has resulted in collaboration among members but often it's not easy to make them involved. People aren't able to get right information how it works, how it helps them how it could get them right reports. Anyway, we can't ignore people who prefer to stay far of new systems. They have different thoughts and believes (Head of IT group, Case A)"*

A further key implementation issue among the IT individual, at the time of interview, was *power to make decisions*. As pointed out in Case C, most of the members believed that power based on senior positions in a hierarchical organizational structure influence individuals' participation.

> *"……..As a manger, part of my job to be able to give a good quality service is to know everything, often members aren't interested and said: why do you want to know this? (Operation IT group, Case C)"*

The interview asked IT individuals to explore individual needs and *incentives* to participate in ITRM implementation. Incentive for RM initiatives that is motivation of individuals can impact the perceived effectiveness of ITRM implementation. Many practitioners have recognised reward systems and motivation as effective factors on implementations. People tend to resist the implementation of new technologies, when there is no reward and motivation for them.

> *"When I need some information- they don't like to answer and said, I am sorry I don't have time for this, I respect them but then I realize it's not time, it's like…… (Operation IT group, Case B)"*

As reported by IT managers (in Case B and C), effective ITRM may influence culture, such as improved communication and consensus throughout the entity, transparency regarding risk information, and a risk-aware environment conducive to taking advantage of opportunities as well as dealing with threats. *Communication* is a stream of knowledge, experience, information transfers among people to gain objectives, with mainly emphases on continual interpersonal interactions.

> *"……. Communication is a way of reducing unexpected events but an argument can be made that routinely communication could happen in an appropriate environment….. Truly hearing the voice of the staff requires a human-cantered approach that doesn't treat their positons …..(IT manager, Case C)"*

A further important element for participating in ITRM implementation in IT department is *organisational capability elements* including: *'the need for training individual'* and *'reporting'*.

It is most likely that *the need for training* was identified as one of main strategies to implement ITRM effectively. The introduction of new concepts will often require training. Training for implementation of ITRM needs to be carried out in the context of the organisation's overall training activities.

> *"I found it simple and complex… The framework was not user friendly at all, it was not understandable to me so I complained about that. I attended the workshops and I have no problem. (Head of IT group, Case A)"*

Additionally, *reporting* on implementation of ITRM will normally be done by a special person who has the responsibility for implementation. Reporting on ITRM implementation should be filed and used in regular reviews of procedures.

> *"Generally, we have my rules of the game and staff should follow them. No tolerance. Okay, we have a rule to force staff to report their tasks, think about them closely, etc., but of course, we always support them to do the best. We can improve daily operations. We provide some experiences and solutions to improve their reports. (Operation IT group, Case C)"*

The last important element for participating in ITRM implementation in IT department is *technical elements* including: *'system efficiency', 'tailoring the system', 'system flexibility'* and *'update the system'*.

As commented by some, factors of *tailoring the system* and *system efficiency* can considerably influence ITRM implementation. The IT department, which developed ITRM scheme had focused their energies on modifying and tailoring system. They developed the scheme to ensure that it was reliable and accurate to apply:

> *"When compared to other tools, ITRM system allows organisations to be more reliable during the execution of IT projects in their unit and we had worked to adjust it to other systems……., the IT group developed and tailored ITRM scheme to be a highly accurate system and felt that it would be a great choice for having a system efficiency. At this stage, the IT managers worked actively with a select people of IT group and conducted precisely tests on the implementation of scheme. (IT manager, Case B)"*

Therefore, the IT group developed and tailored ITRM scheme to be a highly accurate system and felt that it would be a great choice for having a system efficiency and flexibility.

> *"I see the system as a facilitator for mitigating risks and benefits for our organization. Otherwise, management will have to invest a useless lot of endeavour and resources to eliminate problems. (Head of IT group, Case A)"*

A socio-technical perspective in relation to ITRM implementation sees people using IT resources efficiency and effectively for formal ITRM implementation, whereas, an appropriate social environment makes organisations open to explicitly assessing and updating ITRM. This climate allows organisations to be more effective and efficient in acquiring and *updating the system* because it provides organisations with strategic advantages, such as greater flexibility and adaptability.

> *"After the carful modification and changes were done on ITRM, we believe in having most efficient system. We spent more time and costs in developing the system to use it and presenting IT members how ITRM can improve efficiency and accurate in their daily operations. (IT manager, Case B)"*

The section then presented cross-case analysis of the patterns of data for research question one by presenting an overall evaluation of the findings. These descriptive findings were used in the next section where explanations were provided for building a process model of ITRM implementation.

4.2 A Process Model of a Successful Implementation of ITRM

RQ2. What are the key steps involved in the process of implementation? And RQ3. How can these steps be depicted in a model?

In order to streamline the cross-case data analysis process and still obtain relevant information, a timeline was developed (Miles and Huberman, 1994). The objective was to describe the factors and issues that influence ITRM implementation process, and secondly to describe the critical events that take place during the ITRM implementation process to preserve chronology and illuminate the processes occurring (see Table 1). By defining these relationships, we aim to clarify the sequence of events that are identified to design, develop and monitor implementation over time, while also providing insight into interconnections between sub-processes/steps. The sub-processes are interconnecting because the developing ITRM implementation and its improvements suggest after preparations. The line of questioning (interview questions) pursuing a "sequence of events" concept led the researcher to a further key understanding concerning some relationships rather than focusing on the steps in isolation. Thus four steps emerged from our analysis based on timelines. To help the participants reflect upon this stage, prompts of 'early', 'middle', 'later' and 'now' are added to the time line.

Early	Managers investigate all activities required before the initiation of an implementation (commitment). They introduce this framework as a rule within organisation (power).	Need to create an environment of trust & free-flowing communication across the organisation (trust).	Creating motivation among people to participate the scheme (incentive).
Middle	Management provide facilitators (training) & judging the quality of the implementation supporting individual during the day-to-day work.	Management efforts to implement ITRM that are easy to understand, by allocating a champion (responsibility)	Creating a comprehensive diagnosis design regarding the current RM practices were undertaken (security).
Later	Discussions on reporting are conducted across departments on both the management & operational level (reporting)	Manger applied the various approached as accountability sources (tailoring)	
Now	Will need to make some changes & keep update (update of system)		

Table 1 Time Line – critical events that take place during the ITRM implementation process

Combining the interpretations of IT individuals highlights that four sub-processes associated with implementation apparently occur in a recursive manner. The initial cross-case analysis phase labelled these four sub-processes as 'preparation' (early), 'development' (middle), 'improvement' (later) and 'sustainment' (now) respectively. In the early step, the afore-reported techniques are used separately and in combination to help the researcher identify themes, develop categories, and explore similarities and differences in the data, and relationships among them.

Researchers considered the preparation step derived from transparency (level of trust, decision-making power), subjective (the need for an incentive, communication) and leadership commitment (commitment of IT manager) themes. The development step derives from a developed understanding (training, allocating specific responsibility), and IT enabling (system efficiency, system flexibility) themes. The improvement step derives from repairing and accountability (reporting, tailoring the system); and finally the sustainment step is comprised of auditing, capturing (update system) themes.

In 'early step'- preparation refers to the process by which IT managers come to support IT individuals during implementation. As mentioned before, three types of contextual categories assist in explaining how IT managers come to enable individual participation to implementation: leadership commitment, transparency and subjective themes.

> *"First of all, the team leader is responsible to make sure that all possible documents such as risk management policies, guidelines, procedures and templates are collected and disseminated amongst team members. He would ask them to review required policies and documentations and be prepared for the risk planning meeting in advance. We also evaluate the performance of IT risk initiatives through some measures drafted in the planning and modified in our weekly meetings……. there is no motivation for people to accept the new ones. Thus, reward system may encourage individual to accept it. (IT manager, Case A)"*

The research aimed to engage IT individuals in developing an ITRM implementation within IT departments. It was introduced as an initial step towards implementation preparation, allowing every IT member to participate in the process planning by providing their ideas. The intention was that the plan should also be aligned with value embedded in previous standards. Hence, IT member's focused on applying these enablers (transparency, subjective, and leadership commitment) in 'early' stage, through the process theory to ensure an effective and efficient ITRM implementation. The enablers are factors that influence, individually and collectively, whether something will work—in this case, implementation process over IT departments.

In 'middle step'- development refers to the development process where additional training and enablers to the framework are provided. As reported on before, these activities can be classified according to two different but related themes: develop understanding and IT enabler. The development step identified developing understanding through allocating specific responsibilities and training issues.

> *"After introducing the scheme, we run some workshop training, how to apply it and how to get accurate reports….. After a while, we saw that they asked risk manager who is responsible for more information about this system…. it's really like a wavy motion, once you involve a group of them to know it as an efficient system, the system gets further promoted by word of mouth. (Head of IT group, Case B)"*

We identified development step in the 'middle', with focusing on an appropriate social environment makes organisations open to explicitly implementing ITRM. This climate allows organisations to be more effective and efficient in the implementation process because it provides organisations with strategic advantages, such as greater adaptability, reliability and so on. Hence, we found a set of enablers (training, allocating specific responsibility) in 'middle' stage to support the ITRM implementation of a comprehensive management system for IT departments.

In 'later' stage- improvement step focuses on two different themes involving repairing and accountability. An important issue across case A and case C was the type of information that was processed for ITRM reporting. Reporting on the implementation of ITRM would normally be done by a staff member who has the responsibility for assessing and tailoring the scheme. Reports on ITRM implementation should be filed and used in regular reviews of procedures. These reports are formalized, presented to IT individual and archived. The formal report is presented to manager on a regular basis at board meetings to ensure continuity, acknowledgement and a precise assessment. However, IT managers review and approve or tailor this process to insure that resources required for implementation are allocated.

> *"….. I check all details to ensure the system is working in the right way. If I can't understand it and need additional details… I will ask people to provide reports by adding more information…. We need to make some changes…. (Operation IT group Case C)."*

An IT manager in Case B suggested that after the improvement step, it is essential to evaluate how the change is working and adjust preparation step. Sometimes we need to do these changes after auditing and capturing step, which is based on iterative and incremental practices. Thus, this step helps to get results to fix problems and issues with the initial preparations. Miles and Huberman called this step as 'now'- sustainment step. Hence, evidence from the data suggests that a clear representation of the overall process is as a set of recursive processes.

> *"……. assessment of the quality of implementation and improvement of implementation process are a continual and iterative process and occur at all stages of implementation…. After the fundamental assessment and changes were done on the system, normally we need to review the scheme and rules. We spent more time and costs in developing the system to use it how system can improve operational efficiency……. Assessments and amendments are often done regularly to avoid mistakes. (IT manager, Case B)"*

Thus sustainment step continues the use of implementation and supports ongoing management activity. Sustainment is a process of developing reassessment and updating the framework during implementation. Because of the effectiveness of ITRM implementation, the focus for many IT individuals moved from supporting and evaluating into monitoring. The focus moved from 'preparation, development and improvement elements' into 'sustainment element' that related to auditing and capture.

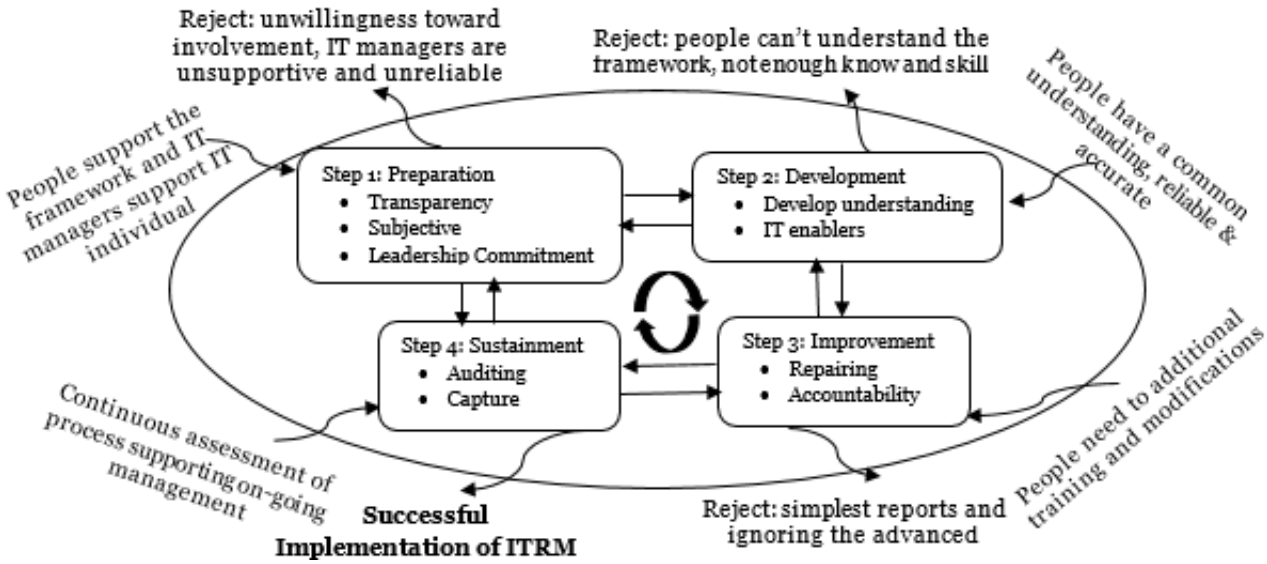

Figure 1: A Process Model of a Successful Implementation of ITRM

This research builds on the illustrative model of ITRM implementation depicted in Figure 1 by proposing a set of five theoretical propositions describing the dynamic nature of the process. As mentioned by Burton-Jones et al. (2015), a meaningful process study must be guided by theory that helps to tell how and why events unfold as they do. The theoretical propositions developed in this research define a preliminary set of associations of the interaction between contextual issues, the ITRM framework itself, IT individual interpretations towards them, and their effect on implementation.

P1. Implementation is best represented as a *SOCIAL* phenomenon. A socio-technical perspective suggests that to understand the ITRM implementation process, pay careful attention to contextual conditions, human actions, interpretations, motivations and their interaction to better understand outcomes.

P2. *PROCESS MAPPING* is the first step involved in ITRM implementation process. Preparation is one of the most crucial steps involved in implementation of ITRM as it highlights the processes involved in the implementation stage, provides a clear idea about the key existing processes and the changes required for implementing the framework.

P3. The implementation process is *FACILITATED* when ITRM implementation practices are interpreted as consistent with the values of individual's IT culture.

P4. Implementation can be *MODIFIED* by repairing and accountability systems. When ITRM implementation is inconsistent with values upon which all IT individuals reach a consensus, changes to implementation can render them consistent. This facilitates the ITRM implementation process.

P5. Implementation is an *ITERATIVE* process. Implementation does not follow a strictly sequential process, but rather a better representation of the overall process is as a set of interconnecting and recursive sub-processes.

4.3 Evaluation of the Resultant Theory

This final section follows guidelines introduced by Sjøberg et al. (2008) for building behavioural theories in software engineering - to evaluate our resultant theory in terms of testability, empirical support, explanatory power, parsimony, generality, and utility.

Testability- refers to the degree to which a theory is constructed such that empirical testing is possible. The ITRM implementation steps of our theory are clear and precise, yet tentative since they are derived from only one process study of IT individual interpretations. Hence, we consider that the proposed theory and propositions are understandable and initially consistent, but under-developed. Therefore, we believe the testability of our theory is moderate to low.

Empirical support- refers to the degree to which a theory is supported by empirical studies that confirm its validity. We provide a thorough empirical case study which confirms and extends prior IS research related to the concept of ITRM implementation. Hence, as there is no prior research investigating ITRM implementation from a process and cultural perspective, we consider further empirical work on this issue is required. We rate the empirical support of our theory as moderate.

Explanatory power- refers to the degree to which a theory explains observations within its scope. Our theory presents working implementations of ITRM that are based on observations and our interpretation of the case study. Gregor (2006) reported this type of theory as substantive theory i.e. formulated for a specific area based on the analysis of empirical observations. Hence, our theory describes ITRM implementations within IT departments. We consider the explanatory power of our theory as high.

Parsimony- refers to the degree to which a theory is economically constructed with a minimum of concepts and propositions. The ITRM process model is rich and with complex description. We integrated several concepts and propositions into a single integrated model to simplify the process. We rate parsimony of our theory as high.

Generality- refers to the degree to which the theory is independent of specific settings. We generalised our empirical findings and statements to theoretical propositions. The scope of our qualitative research is narrow, which is typical of substantive theories. Hence, the aim of a substantive theory is not to be generalizable as such but rather to be transferable. We consider the generality of our theory as moderate.

Utility- refers to the degree to which a theory supports a relevant area of the IT industry. ITRM are very relevant frameworks to mitigate IT risks in industry. Managing IT risks has become a critical part of regulations, standards, best practices, and is consistently rated among the top five issues for CIOs. We conclude that our theory of implementation is both a fresh and enlightening contribution especially considering scarcity of substantive theory about ITRM implementation. Hence, we consider the utility of our theory as high.

5 Conclusion

The research developed a conceptual model of process that includes four steps to understand the implementation process. Evidence from the data suggests that a better representation of the overall process is as a set of interconnecting and recursive processes. Accordingly, this research is distinctive and differs from previous research in four important ways. First, given the domination by positivist research methods and a variance perspective framing much of the research within ITRM, this research provides freshness in perspective to the research domain. Second, a position is taken advocating that research on the phenomenon needs to be widened to examine the process of implementation from the perspective of the IT individual members. Third, given the paucity of previous research on ITRM implementation, this is the first empirically focused effort to develop a substantive theory of ITRM implementation. Fourth, the core concerns of this study are pursued by means of inductive analysis and interpretive methods respectively. It is argued that interpretive methods have the potential to produce

greater understanding of ITRM phenomena including the development of propositions and a model. There are some limitations attributed to this study that should be noted. The study recognises that the research design and methods used here cannot be expected to offer the same degree of precision and reliability of results as the traditional causal-mechanistic methods. Hence, here the study recognised the serious lack of established theory and prior empirical research on ITRM in general. Thus, at this stage of knowledge accrual about ITRM implementation, the need for greater precision in research must be viewed in balance with the long-term benefits of first generating meaningful, and field-relevant theory.

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