

Business Process Analysis in Risk Assessment: Facts and Challenges

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Business-IT alignment is a long-awaited idea that requires a focus shifting from employing information technology (IT) more intensively to a less IT involvement with respect to management of business processes. This calls for greater provision of ownership to business user than before. This study aims at examining current facts and future challenges ahead of business process modelling adoption for business and information system assurance services as one example of business uses of business process management. Existing relevant literatures and interviews with focus on business and information assurance were conducted, in which the context of how assurance professionals interact with business process models for risk and control assessment is set up. This paper reveals the benefits of adopting business process modeling for auditors toward understanding a companies' business processes and the challenges to be considered for further development.

Key word: business processes, business process models, risk and control assessment, assurance.

1. Introduction

Rapid change in recent competition requires increasing focusing on business processes in order to maintain the competitiveness on a company. Adopting a resource-based perspective, it can be suggested that it is the business processes belong to the factors that make up a company's distinctive resources – valuable, rare, non-substitutable – that are costly and ineffective to imitate (Bharadwaj 2000). The adoption of Business Process Management (BPM) which adopts IT for automating business processes is considered a compelling initiative to organizations. Further examination of how BPM would exhibit its business use to specific area is therefore imperative.

Process models –graphical representations of how organizations conduct their business processes – plays an important role in all phases of BPM lifecycle. They arguably provide some advantages e.g, process improvement, compliance management, knowledge management, quality assurance, end-user training and software implementation (Mendling 2008). Put it short, process modelling could deliver potentially propitious merits on business and IT alignment. A recent study showed that process modelling is among the top six purposes of conceptual modelling (Davies et al 2006). Process modelling takes place in different BPM phases: to document organizational processes and to specify information system requirement (Figl et al 2009); to conduct process improvement, understanding and communication between participants (Indulska et al 2009); to provide specification of an executable automation or semi automation workflow (Mendling et al 2008).

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Documenting, understanding and improving processes through business process modelling are also central to accounting and information system assurance domain (hereinafter called assurance). Ranges of fields are involved, spanning in particular financial audit, business advisory, and information system assurance sphere. Specifically, understanding an organization's business at the process level is essential to both fully comprehending risk with the consequent material misstatement and internal control addressing such risks (Carnaghan 2006). Assurance specialists (control consultants and auditors) pay considerable attention to business processes understanding to help identify, analyse, and measure risks on accounting material misstatement tied to identifiable business risks and the associated controls mitigating such risks, hence business process risk assessment.

Although assurance professionals have to comply with widely accepted professional standards, the review procedures may differ between consulting firms. Each firm has its own methodology to comply with standards or regulatory requirements, making it firm specific. These firm specific audit methodologies might adopt business process models to various extents in risk assessment. Given that the representation of a business process and user characteristics are of importance for cognitive processing and for better domain understanding and decision making (Recker & Dreiling 2011; Khatri et al 2006; Dunn & Grabski 2001), an investigation of how business process models are adopted and presented for risk and control assessment for business process is warranted.

In line with this observation, the main goal of this paper is, analytically, to identify facts and possible challenges that may be encountered on risk assessment with respect to the use of business process models in an assurance context. The finding of the recent paper however is arguably important. It provides a preliminary step toward a more complete insight to the body of research, given the paucity of works intertwining business process modelling and accounting information system fields. The rest of the paper is organized as follows. The next section discusses literature on the state of BPM, process modelling and business process risk assessment. Section 3 describes the research approach for studying the topic in this paper. Section 4 summarizes works on business process risk assessment and future challenges as the result of our interview, with subsequent section 5 concludes our findings.

2. Literature Review

A business process can be defined as a set of logical and interrelated sequence of activities in a certain loop, which are performed to accomplish a particular business objective delivered to process stakeholders (division, customer, supplier, etc). A business process as the core of the organization function is considered important for a company as it primarily consists of processes, not products or services (Krinjar et al 2008). They are the key instruments to organizing these activities and to improving the understanding of their interrelationships (Weske 2007).

As a business process becomes a critical resource of a company, greater awareness must be placed on the uniqueness of business processes. Criticality of business processes is enforced through the notion of BPM and BPM life cycle (Mendling 2007), from which an organization can allocate resources and optimize its process design proportionally in certain phases in the life cycle. Once business processes are defined,

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they can be subject to analysis, improvement, and enactment from organizational and technical perspective. Therefore, BPM includes concepts, methods, and techniques to support the design, administration, configuration, enactment, and analysis of business processes.

BPM entails a lifecycle of process discovery, analysis, design, implementation, execution, monitoring and controlling (zur Muehlen & Ting-Yi Ho 2006). Figure 1 displays the different phases throughout the lifecycle indicating constant anticipation on change. Some phases would incorporate IT, reflecting its inclusion as instrumental part for business process implementation. There has been however a major shift in viewing the role of IT for business process development. Favorable development in cloud computing, service oriented applications and web services facilitate a gradual shift from a more technical focus to a more business focus. This means, current development would let business people to have greater ownership on business processes than before (Smith & Fingar 2003).

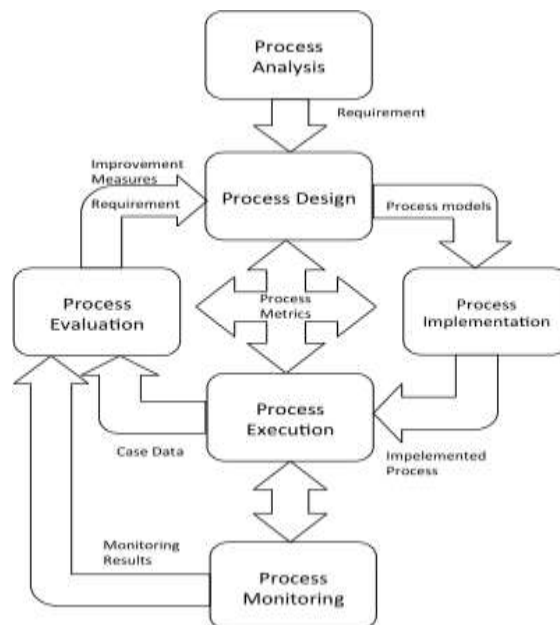


Figure 1: Business Process Management Lifecycle

Business process models are essentially visual representations of a business domain. Visual representations are effective for supporting decision-making about a business domain because they tap into the capabilities of the powerful and highly parallel human visual system (Moody 2009).

Studies of business process modelling for assurance domain are at the nexus of business process modelling, cognitive science and accounting information system. The business process modelling literature is used for explaining what needs to be modelled to understand a business process, and demonstrating the feasibility of business process modelling. With relation to cognitive science, the studies centre on how alternative business process representations externally impact a user's problem solving performance (Alencar et al 2008). Accounting information system elements focus on risk and control consideration over financial reporting process and various corresponding business processes in a company.

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In general, studies on business process representation can be explained under two different yet related fields. First are those examining the relationships between different forms of information representation with judgment and decision making. The work of Larkin and Simon (1987) suggests that the form of visual information representation can be advantageous over textual representation in terms of efficiency of information search, recognition of information, and inference upon the information extracted, provided that the representation creates not only informational equivalence but also surpasses alternative form with its computational equivalence.

The cognitive fit theory (Vessey 1991) explains that a correspondence between task and information presentation format leads to superior task performance for an individual user. Studies empirically test the cognitive fit between four modelling techniques but do not extend to the comparison with narrative representation of business process (Griggs et al 2006; Jones et al 2002). Within this area, Kelton et al (2010) develop an integrated model of information presentation research based upon the theory of cognitive fit and use the model to summarize prior literature.

The second field has a specific focus on business process analysis for assurance. The International Standard on Auditing (ISA) 315 states the importance to understand information system and business processes (IFAC 2010, paragraph A84).

“Obtaining an understanding of the entity’s business processes, which include how transactions are originated, assists the auditor to obtain an understanding of the entity’s information system relevant to financial reporting in a manner that is appropriate to the entity’s circumstances.”

In relation to that, Dunn and Gerrard (2001) examine the effects of alternative forms of information system documentation on auditor decision making and find that a high degree of localization is connected with a low user experience importance i.e, greater localization on specific area of attention enable user to understand problems better with lesser reliance on experience. In line with that, Carnaghan (2006) suggests internal controls on a process level as a way to address business risk and the risk of material misstatement. Kopp and O’Donnell (2005) suggest that a business-process focus is found to be more effective for organizing internal control evaluation tasks and category knowledge than an objective focus. Furthermore, O’Donnell and Schultz (2003) found that audit seniors were better able to identify risks when using audit evidence according to business processes as opposed to transactions. Interestingly, while business assurance had long been utilizing process documentation tools, namely flowcharting diagram, Recker et al’s (2009) ontological analysis report constructs deficiencies which may explain the limited capability of explaining all business phenomena required for auditing related decision making.

3. The Methodology and Model

The paper aims to yield a preliminary practice-driven research agenda on business process modelling use for risk and control assessment. For this purpose two approaches are conducted:

1. Initial exploratory interviews with selected professionals in business assurance and information assurance. This interview aims at obtaining the current state

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of practical use of business process model in the assurance and advisory domain. We need to understand what role and to what extent the types of the adopted business process representation play in facilitating auditors to perform assessment over risks and application controls at business process level.

2. Classification of existing issues and challenges from a literature review to structure and validate facts and challenges identified during the interviews. The resulting generic classification will serve as a reference to bring out workable categorization of issues and challenges specific in risk and control.

The interviews were scheduled with six assurances professionals working in business assurance and information assurance at top consulting firms in Germany. Five of the meetings were personal meeting while one of the meetings was a telephone conference. Following Rikhardsson et al. (2006)'s advise for establishing key criteria, the selection of the participants as well as the firms are mainly based on familiarity with issues, size, working experience, breadth of expertise, and acceptance.

An exploratory interview was adopted by following a semi-structured approach. A question list mentioning several general issues on risk and control assessment and business process modelling use for risk identification were used as the general guide (Ritchi 2011). The interview was set to be in a semi-formal setting to facilitate a more open and spontaneous discussion, enabling senior consultants and managers to comment on multidimensional perspectives regarding the notion of business process model and risk assessment. Figure 2 depicts the collapsed version of main questions to the interviewees.

- + Demographic questions
- + General approach to risk and control assessment
 - + Importance of risk assessment
 - + Importance of business process understanding for risk evaluation
- + Detailed analysis with process models adopted
 - + Important features to capture
- + Detailed analysis without process models adopted
 - + Important feature to capture
 - + How to achieve business process understanding
- + Strength and weakness perception of using process model for assurance

Figure 2: Questions list during Interview

The profile of the participants interviewed is shown in table 2. All interviews were recorded and transcribed, except for one interviewee who refused to being digitally recorded.

While conducting the interview, we also perform a classification of existing issues and challenges from relevant literatures to structure and validate facts and challenges identified during the interviews. The classification is based on prior researches which investigate issues in BPM and business process modelling regarded as key concern for different stakeholders, *inter alia*, vendors, academics and experts. Key areas discussed in BPM may encompass benefits of business process modelling, business process language standardization, key risks and control important to BPM or

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modelling projects and communication issue within project management. Findings from the prior BPM-focused works are then analysed and mapped to the classification of facts and future challenges applicable to business process risk assessment as close and relevant as possible.

At the outset, we collected data from five prior research papers obtained from specific yet comprehensive BPM and business process modelling libraries which are produced by scholars who are respected and prolific in BPM fields. These research experts arguably have been working in this domain approximately for over five years with their works and have been cited by various researchers and practical experts. Brief description of the works as current research main inputs are found in appendix.

Three of five research papers are part of global study on the main issues in BPM. For sharpening the relevancy with specific use of business process modelling for assurance, we excluded strategic level obtained from the three global study researches. Subsequent analysis involves mapping the total population of issues or challenges to listing of issues and challenges suitable for business and information system assurance processes.

To the best of our knowledge, no guidelines exist for mapping general BPM issues to domain specific matter. However, cares are taken to ensure the mapping process demonstrates rigorous quality. Issues and challenges for business process risk assessment must have a logical relationship with those in the more general list. Interview results are then matched and classified with issues specific to assurance to enhance external validity of the findings.

4. The Findings

Table 2 shows demographic information of respondents. Respondents have been providing services to variety of industries/clients ranging from energy, power utilities, technology, real estate, construction, industrial, logistics, automotive, and retailers. Banking and financial client are normally handled by other division. Client sizes are varied, ranging from small medium companies up to global enterprises, though these firms' clients are normally multinational in nature.

Table 1: Profile of Interviewees

Respondent	Experience	Position	Domain of Expertise	Firms	Interview Mode
P 1	More than 5 years	Senior Manager	IS Assurance and Advisory	International Accounting Firm	In person
P 2	5 years	Senior Consultant	Business Assurance	International Accounting Firm	In person
P 3	More than 5 years	Senior Consultant	Business Assurance and IS Assurance	International Accounting Firm	In person
P 4	5 years	Assistant Manager	Business Assurance	International Accounting Firm	In person
P 5	More than 5 years	Manager	IS Assurance and Advisory	International Accounting Firm	Telephone
P 6	1.5 years	Consultant	IS Assurance and Advisory	International Accounting Firm	In person

A counted 59 issues are initially observed during the mapping process corresponding with general BPM domain combined with business process modelling issues. These

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issues are partly overlapping and contradicting, so a logical classification mapping process is taken to get a more general BPM issues encompassing the overlapping factors. Example of cases where overlapping takes place is the mention of standardization, which are mentioned by more than three researches. We code “standardization” referring to all general issues regarding the situation where standard becomes an issue.

Final figure reduces the number into twelve generic topics for further mapping to assurance related issues. Table 3 presents the verification of literature-based general issues by findings from experts interview. Among the topics listed are standardization, communication, modelling level of detail, training and expertise and many others.

Three researches from our studies reference work under a global BPM study organize issues related to BPM into three organizational areas, *viz.* Strategic, tactical and operational. As mentioned before, we exclude the issues identified for strategic level to maintain work clarity as we strive to gain clear figure business process level in BPM.

Following the overall counting, business process risk specific issues are derived and reported, considering the relevancy criteria set upon at the outset. There are at least eight issues considered to be potentially significant facts or challenges in risk and control assessment over business process. Findings from interview transcripts are then matched to the list of issues constructed from literature analysis to the issues framework. Transcript of participant’s response reveals a reasonable mapping from literature in BPM and business process specific issues.

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Table 2: Major Facts and Challenges Relevant to Business Process Risk Assessment

BPM/Business Process Modeling	Business Process Risk Assessment	Related issues mentioned in Interview	Occurrence by Participants
Standardization	<ul style="list-style-type: none"> • Standardization for risk assessment 	<ul style="list-style-type: none"> • Language standards • Notation • Features to be captured • Methodology 	6
Communication	<ul style="list-style-type: none"> • Communicating risk on specific place in business process points • Communication within team 	<ul style="list-style-type: none"> • Between business auditor and IS auditor to determine risk factor based on management assertion • Difficulty in assessing what to do with findings from the IT audit. 	5
Understanding	<ul style="list-style-type: none"> • Risk identification of business process from process model • Integrated business process view 	<ul style="list-style-type: none"> • Help understanding key processes • Maintain logical reference to financial assertion 	6
Modeling level of detail	<ul style="list-style-type: none"> • Risk and control profile by expanding process model 	Trace risk on detailed business process level	6
Business-IT alignment	<ul style="list-style-type: none"> • Identification of IT related control for business assurance 	<ul style="list-style-type: none"> • Using business process model to help IS auditor identify IT control aspects for financial audit • Use of relaxed version of process model rather than accepted standard. 	3
Business value of Process model	<ul style="list-style-type: none"> • Process model metrics for risk measurement 	<ul style="list-style-type: none"> • Help auditor assess risk • Basic start for evaluating process 	2
Expertise and Training	<ul style="list-style-type: none"> • Education of business process modelling for assurance domain 	A challenge to get big audit firms or universities to actually promote this process model	3
Methodology	<ul style="list-style-type: none"> • Inclusion of certain business process model for risk analysis purpose • Level of adoption in the audit team • Reference model for assessing business process and IT risk. 	[process model] not mandatory in audit program	6

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From the interview with experts presented above, it can be seen that risk assessment current facts in general follow the same pattern with the superior issues in BPM. Out of twelve facts identified that may concern BPM community, eight of them have consistent appearance in business process use on assurance. Some of them stay to be current facts that within a short time can be handled with current development of tools. Some of them may or may not manifest into challenges assurance professionals face, which consequently requires them to anticipate.

Some interesting figure can be observed from the interview findings. Four of the facts are evidenced to be the most frequently uttered in interview transcript, namely standardization, communication business process understanding, and methodology. Modelling level of detail follows the second most mentioned while the rest are the least mentioned or discussed by participants.

One however should be alerted. Not all participants' recorded transcriptions were shown in the recent analysis. We purposively select comments such that only those comments that lead to a specific emphasis will be taken for further consideration. Comments that do not lead to the perception that they emphasize particular facts are excluded from consideration. For example, business value (ability to measure process), though mentioned by one participant, however the original motive is more on the risk calculation based on the structural metrics of process model. While this would be a good idea, including it as part of business value fact appears to be less salient.

Standardization involves issues like which business process modelling languages appropriate to be adopted for community wide, what diagram notations would provide more logic and facilitate business process understanding to user, features auditors need to capture and other things. In this case, standardization of business process models seems to be both fact and challenge for assurance. For example, both business and information system auditor are continue using relaxed form of flowchart. The recently proposed accepted standard BPMN (Business Process Modelling Notation) by OMG (BPMI/OMG 2006) does not seem, in the short term, replace the flowchart as users' tool for risk and control identification.

Next related facts that are also challenge for the near future is the issue of understanding. This problem does not stand-alone; rather it depends on various factors. One of the factors is the extent of knowledge of the users reading the process model and eventually articulating them into risk assessment. Individual cognitive quality plays major role and it works side by side with tool used by the user. One participant says that the importance of business process model is to help auditors understand the key processes, which may have risk factor residing in the business process. The ability of an auditor to understand business process risk through process model indicates its importance. Ensuring that process model provide ease of use understanding to users might be a critical challenge for the acceptance of process model. Practically, all participants emphasize understanding as facts and future challenges need to be considered.

Communication relates to how best risk and its associated control are effectively shared by the whole assigned team both to financial and information system. IS auditors perform audit over client's IT control in conformance with the assertions prepared by financial auditors. The resulting work is opinion regarding the

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effectiveness of IT control that relates to the financial reporting. Current fact is that between business assurance and IT assurance there are somehow different procedures guiding each of them. Since business process model is not required obligatorily in audit program, the adoption of business process model for mediating both sides stays as future challenge.

The absence of business process model integration in audit methodology is not deemed to be serious issues. What happens currently is that the working program has not yet enclosed business process modelling specifically for risk assessment, even though all participants confirm the merit of analysing business process risk through diagrammatic representation. Hence vision to integrate business process modelling remains future challenge for assurance community.

5. Summary and Conclusions

This research acts as a step toward a more comprehensive examination of business process modelling for assisting risk assessment. Reflecting on the findings and the discussion above, several avenues for future research are identified. First, it is of potential value to study the alignment of risk into business process modelling. The possible combination would be to create specific risk and control notation as part of a diagram properties or to annotate business process model by risk text.

Second possible extension is more on a semantic and pragmatics view of research body. The merit of business process models should be examined to individuals who deal with the model by considering their some cognitive variables. Handful of researches regarding the external representation role on judgment and decision-making exist. Since results in this domain remain mixed, endeavour to complete the literature suggest for further works. However, one should bear in mind to increase scrutiny to avoid bias due to so many factors.

Third, a case study on which the business process model are integrated in audit methodology or where metrics on business process model are adopted for calculating foreseeable risks and how this risk could be prevented by establishing proper internal control. Last possible research would be to verify the result of the current work's classification by testing it against real world situation. Since this current work is deemed to be in preliminary level, examining the research external and internal validity of such model would make the future study more complete.

Business process modelling is an important requirement within BPM, yet it still represents a significant challenge to many organizations. This paper presents the results of a preliminary work examining current facts and future challenges in the business process modelling in particular for risk assessment. The identification of the most critical issues and challenges – from extraction of selected prior researches as reference – facilitates a deeper insights for both practical and research community.

On the basis of the findings, it can be argued that assurance professionals could pay specific attention for standardization, understanding, communication and methodological aspects of business process model in risk assessment. To that end, both business process modelling and assurance service should be collaborative when exploiting process model. Potential reference can also be found in another work that

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discusses and establishes a structured classification of business process models use for risk assessment: the issues encountered on the mode use and the extent of the business process model use (Ritchi and Mendling 2012).

Limitation of the report is focused on the relaxed semi-structured interview and a more inductive reasoning for obtaining relevant figures of possible facts and challenges of business process risk assessment. With a refinement in research approach and sample, it would make a more complete view of business process models role for assurance fields. Furthermore, doing this work may empirically exhibit limitation. But it is important to note that this preliminary work of the sample is to point out areas that currently relevant for further robust empirical investigation.

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Appendix

Paper	Topic Addressed	Scope	Research Approach
Indulska et al (2009)	Process modelling benefits	Academics, vendors and practitioners	- Three rounds focus group discussion
Indulska et al (2009)	Current issues and future challenges	Academics, vendors and practitioners	- Three rounds focus group discussion
Indulska et al (2007)	Issues from vendor perspective	Strategic, tactical and operational level	- Qualitative analysis of vendor interview - Multi-method study
Bandara et al (2007)	Issues from expert perspective	Strategic, tactical and operational level	- Qualitative analysis of vendor interview - Multi-method study
Indulska et al (2006)	Issues from user organization	Australian wide companies with strategic, tactical and operational level	- Qualitative analysis of focus group discussion with cross-industry sectors - Multi-method study

Table : Prior research reference model for issues and challenges in BPM