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Factors Affecting Business Process Management System Adoption and Diffusion

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Abstract

In recent years, business process management (BPM) is a vital methodology or strategy to drive business management agilely. It is an approach that can make the organization achieve effectiveness and efficiencies through creating and ameliorating its business processes according to its business strategies, objectives, and requirements. There is no doubt that dynamic and flexible business processes are important for business stakeholders. Later, business process management systems (BPMS) are developed and designed to assist organizations to achieve their BPM goals and to coordinate business resources and information flows as a business intelligent system. Thus, BPMS plays a significant role in implementing BPM strategies for an organization. However, although BPMS has its advantages, not all cases of BPMS implementation are successful. Business stakeholders will definitely compare different systems, and they

may not be eager to replace their old systems by adopting BPMS. Hence, stakeholders would consider all the factors in order to make the final decision: whether to implement BPMS or not. Some of these factors may spread the BPMS application. However, by contrast, some other factors may prevent BPMS technology from further development. Therefore, we are interested in the factors that have influence on BPMS adoption and diffusion. A questionnaire is designed to investigate this topic and the significant, moderate, and obstructive factors are concluded in the end.

Key words: Business Process, Business Process Management, Business Process Management System, Factors, Adoption and Diffusion, Business Process Change, Knowledge Management

Acknowledgement

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1 Introduction

1.1 Background

The fast development of modern science and information technology has dramatically influenced our daily life style, and consequently the market has become increasingly complex and variable. In order to win more competitive advantages in this severe situation, more and more companies have realized the importance of utilizing information technology to support and improve their working processes. As for commercial companies, the use of information systems and information technology enables them to make business decisions more easily and quickly. Meanwhile, various kinds of information systems are developed to enhance the effectiveness and efficiency of the business management activities. A business process, suggested by Weske (2007), contains a series of activities, which are performed collaboratively in an organizational and technical environment. These activities are carried out in order to achieve the business strategic objective. By using information technology and information system, some business process activities could be improved automatically, instead of being carried out manually by the employees of the company (Weske, 2007).

In recent years, business process management (BPM), an essential methodology or strategy that can drive business management agilely and excellently, are widely diffused (Tian & Quan, 2008). BPM is an approach to make the organization achieve effectiveness and efficiencies through creating and ameliorating its business processes so that the requirement of its business strategies, objectives could be satisfied. BPM is

> "*A systematic, structured approach to analyze, improve, control, and manage processes with the aim of improving the quality of products and services,... BPM is thereby the method by which an enterprise's 'Quality' program (e.g. TQM, TQC, CQI) is carried out. (Elzinga et al., 1995; Chang, 2006, p.29)* "

Besides, Weske (2007) described the BPM as a combination of concepts, method, techniques that is used to provide assistance for the business process design, administration, configuration, and enactment and analysis, there is no doubt that dynamic and flexible business process is needed by business stakeholders and thereby the business process has been increasingly variable and elastic. However, these characteristics of the business process might cause more precise and strict requirements on business process management systems (Tao, 2008).

Business Process Management System (BPMS) refers to "*a generic software system that is driven by explicit process representations to coordinate the enactment of business process.*" (Weske, 2007, pp. 6).

Jeston and Nelis (2006) introduce a brief history of business process management development. The prevalence of BPM has experienced a long and difficult progress. During this process, it has accumulated a large number of successes and failures of various kinds of management theories and approaches that focus on achieving the process-based organizational efficiency and effectiveness. The following descriptions are the history of BPM development:

- In the 1980s, Total Quality Management (TQM), a manufacturing approach, created in the U.S. After that, Toyota, a well-known Japanese company effectively applied this approach to produce high quality products in order to occupy more market; from then on, the TQM was turned into an advanced method in process management (Jeston & Nelis, 2006).

- In 1986, the methodology of Six Sigma was created to focus on process change. It aims to raise the awareness of the value of improving the process (Jeston & Nelis, 2006).

- In the early 1990s, Hammer and Champy (1990) proposed Business process Reengineering (BPR).

- In the middle and late 1990s, Enterprise Resource Planning (ERP) systems became popular. Many venders began to provide improved methods and "solutions for all

your problems" for organization. However, the ERP systems might not be sufficient for handling organizations' problems in processes. They cannot help to improve the process or make it as efficient and effective as it could have been (Jeston & Nelis, 2006).

- From the end of 1990s to the early 2000s, CRM systems focusing on the customer view and customer experience were started. This kind of systems has nothing to do with "*the back-office processes*"(Jeston & Nelis, 2006).

- In 2002, there was "the third wave for BPM". Smith and Fingar (2002) raised significant interest and discussion*,* which leads BPM to be the most prevalent and attractive topic about management.

BPM development triggered technologies evolution. Initially, business process platform and Communication-Enabled business processes appeared in information system field. Later, business rule management systems and business process network had impelled the technology development to get the first development peak when BPM movement reached the top during 1990's. The important concept of business process management suites came forth too. However, the trend of BPMS development slowed down and experienced a trough until 2000 year. Business activity monitoring and event-driven architecture research started the third round development and guided a positive trend for BPMS development. Since 2003 year, BPM has become a hot topic again, and consequently BPMS implementation plan has become increasingly popular. It has been more and more applied in our daily business management (Harmon, 2007). This positive development trend, to some degree, is in accordance with marketing and business customers' requirements. However, the real reasons that arouse this third wave for BPMS implementation and the factors that influence BPMS adoption and diffusion are in an interesting research realm.

1.2 Problem area

Weske (2007) argued that BPM has received considerable attention recently by both business administration and computer science communities. Aiming to improve customer satisfaction, create new products, and implement services at low cost, business stakeholders prefer to adopt BPM to enhance their business operation. As a methodology, BPM can conduct process-centric system design. BPMS are designed to promote business processes and to monitor these processes, adapting for organizations' requirements and human actions. Usually it contains BPM suite, business process analysis tools, workflow engine, business activity monitoring software, business rule engines, user interaction, and document or content interaction etc...(Harmon, 2007). All of them are used to execute tasks and processes. However, since there are various types and complex conditions in different organizations, there are still problems. For instance, adopting a BPMS always costs a large amount of money, and sometimes it might be difficult to estimate whether it can help the company be more competitive and gain more profit in the near future. Besides, BPMS is a sophisticated tool, therefore it might be difficult to estimate whether BPMS could be utilized successfully? Which factors will affect BPMS application?

Different organizations have distinguished business processes and strategies. To pursue a successful application, the organization should consider how to use and compound appropriate tools or subsystems to help to achieve their BPM goals and decrease technology-related risks. In fact, although BPMS has lots of advantages, BPM development history trend curve is not always upward as we mentioned before. Thus, we may conclude that the factors which have great impact on BPM and BPMS implementation hide behind the events. In other words, some factors limit BPMS utilization, and other factors impulse BPMS application. What's more, some certain factors are even two sides of a sword.

1.3 Research Purpose

According to problem area, as a consequence, this research aims to analyze, discuss and then figure out the factors that affect the adoption and diffusion of BPMS. Business process management systems (BPMS), such as helping enterprise manipulate automatically different working systems and connect them together based on working processes, are designed to assist organizations to achieve their BPM goals and strategies and to coordinate business resources and information flows as a business intelligent system. During its working processes, they are automated to complete their jobs. BPMS also plays an important role in implementing BPM strategies for an organization (Blokdijk, 2008). Although BPMS has its advantages, however, not all implementation case is successful. In this situation, business stakeholders may not be willing to replace their old system necessarily instead of BPMS. This study aims to learn the experiences of both BPMS vendors and BPMS users. We seek to understand the strategic business objectives of the company that we investigated as well as their specific requirements on BPMS, from a BPMS user's point of view. On the other hand, we are also interested in discovering the factors adoption and diffusion from perspectives of designers, such as BPMS vendors.

1.4 Research Question

Regarding the adoption and implementation of BPMS, there are many affecting factors, some of which may improve the BPMS application, while the others may probably prevent BPMS technology from further development. The BPMS vendors should understand the company's strategies and requirements, tackle those drawbacks and difficulties, and then convince their clients of the usability and effectiveness. The clients would care about what benefits they can get after implementing BPMS. These reasons will impose a profound effect on the adoption and diffusion of BPMS. Therefore, we propose our research question is: *Which are the factors affecting BPMS adoption and diffusion?*

1.5 Delimitation

Since the information technology and information systems are playing a significant role in the business process management (Weske, 2007), it is necessary to make our research focus on the information systems area. We discover and analyze the factors that influence the use of BPMS in business and technical perspective. We will investigate its adoption, diffusion and also what characteristics lead it to be increasingly prevalent. Thus, we need to have an insight into business requirements and technology application.

In addition, a company may probably have its unique and special business strategy and mission. As a consequence, different companies will utilize different kinds of information technologies and systems to support their management activities. Even though some factors that affect the adoption and diffusion of BPMS could be figured out, these factors may not be generalizable. These affecting factors will only reflect the perspectives of the respondents, who have participated in this survey.

1.6 Research Strategy

This research is an empirical study that copes with factors in BPMS adoption and diffusion. Both qualitative and quantitative approach will be used to conduct this study. Using qualitative tools aims to express our view and conceptualize BPMS and its application. In addition, a survey will be carried out among the companies that using a BPMS. Therefore, some qualitative concepts and methods are necessary for designing a questionnaire and conduct the survey. On the other hand, we will use quantitative methods and software applications, such as Excel and SPSS, to analysis the results of the survey, and then draw a conclusion.

2 Theoretical Studies

2.1 Business Process

Cummins (2008) defined processes as the linkage between an organization itself or between its "*suppliers, partners, distribution channels, products and services, people, and other stakeholders.*" It means process exists in the whole business procedures and connects each business development steps. The following sections will further discuss what business process is and why it is critical for business management.

2.1.1 Understanding Business Process

Davenport (1992) defines a business process as "*a set of logically related tasks performed to achieve a defined business outcome for a particular customer or market.*" (Weske, 2007, pp.5). A business process starts with an active beginning and ends with a conclusion (Bridgeland & Zahavi, 2008). Every procedure is an activity as an atom existing in the process and then diversity of activities are composed of business process. The process points out a unit of work which should be done, clarifies people who does the work and has taken the responsibility, specifies when the work needs to be done, and finally finds what the work has influence on business outcomes (Cummins, 2008). In other words, a transparent process reflects the details in the business management at operational level -- day-to-day management of an organization.

Usually, most of organizations may be concerning about business process because they intensify their capability of manipulation to reach its business goals and objectives. It is essential for business management to get the efficiency of information transformation between processes. There is information flow between processes and tasks. Thus, filtering information in time and in right place is very important to make organization run well. Organizations might be interested in controlling business process and a process-centric organization concept comes out. Harmon (2007) defined a process-centric organization as:

"an organization whose managers conceptualize it as a set of business processes where they place their primary emphasis on maximizing the efficiency of processes, but not on maximizing the efficiency of departmental or functional units.(Harmon, 2007, pp.1) "

That is each process implements organizations' business plans, links different and consistent activities, and achieves their strategies.

2.1.2 Business Process and Value Chain

In section 2.1.1, the general concept of business process is introduced. Further, this section continues to describe what value chain is, what the relationship between value chain and business process is, and why they are important guides for business management from academic perspective.

The famous definition about value chain is proposed and popularized by Porter (1985). He delineated value chain analysis structure shown as the following picture (Figure 2.1). Porter (1985) categorized the basic activities, which include inbound logistics, operations, outbound logistics, marketing and sales, and services, at the same time fractionized activities, which involve administrative infrastructure management, human resource management, technology, and procurement, to support formal basic activities. A value chain (Hedman & Kalling, 2002) is a linkage of series of working activities as a large process to achieve working objectives. It can help organization to operate input and output information in every step, so as to make all activities in order and realize each activity's value. For improving quality of business management, describing the value chain could achieve this goal because it visualizes the working activities.

Firm infrastructure				
Human Resource Management				
Technology Development				
Procurement				
Inbound Logistics	Operations	Outbound Logistics	Marketing Sales	Service

Figure 2.1   Michael Porter's generic value chain (Porter, 1985)

A value chain is a large-scale business process (Harmon, 2007). From Porter's value chain diagram, every function added value performs business process through a series of activities (Porter, 1985). All of the activities should be comprehensive and transparent to perform appropriate business processes. Especially, taking manufactory for example, it needs to focus on production procedure to manage its product lines and also connect with its suppliers and its distribution channel. Further, a company would transform their materials from a raw form into a distinguished form to add additional value by the manufacturing process (Cummins, 2008). In this case, every produce and sale process cannot absolutely exist in business process and connect with other business functions, even other industry fields (Cummins, 2008). It is necessary to synthesize the whole business process which requires that there is no gap between two activities. That means communication and collaboration are very crucial for carrying out well-organized business process to realize each step's value.

By optimizing the processes that could produce the high quality of goods according to customer needs, integrate managerial and product resources, intensify customer services to improve customer's satisfaction, and so forth (Hedman & Kalling, 2002). Therefore, most of organizations may pay much attention to manage their value chain and streamline their business process because these methods bring their benefits. Also, one of goals of process design or redesign efforts is to eliminate useless activities and add necessary activities, in order to obtain well-run business process environment and

achieve business strategies or objectives (Harmon, 2007). Thus, articulating and visualizing the value chain is good for business operation and eliminate the gap between departments.

2.1.3 Business Process Change

As mentioned before, the value chain describes a standard and integrated business process for an organization. Business processes, liking value chain, should be designed or redesigned to adapt organization's compliance requirements and new business environment, avoiding implementing useless tasks and business risks. Even, some uncertain factors and variables will have impact on business processes and business strategies.

Harmon (2007) argued business process change should reflect what business activities expect manipulated by managers. For instance, if a company wants to introduce a new product into its business, new processes require new measurements and new business objectives so that the formal process might need to be changed. Also, he thought employee's performance also has to alter his or her work efforts to contribute themselves into new business process. In addition, new resources are put into new production so that business processes are asked for the integration and combination of new resources (Harmon, 2007).

Davis (2008) proposed that the business process should meet the customers' requirements and demands to ensure the tasks' or activities' validation. That might attract a new customer, enhance the degree of customer's satisfaction, and keep their loyalty. Furthermore, in this case, it can provide an excellent service in order to keep and increase competition. Meanwhile, the more efficient processes are; the lower total management cost is (Cummins, 2008). Thus, companies would like to improve their service processes reflected dynamic demands to achieve these goals efficiently.

Harmon (2007) convinced "*how work gets done*" impulses constant innovation and

productivity increases and a company should emphasize on business process in order to figure out "*how the work gets done*". Each employee needs to know how to do tasks better and faster to improve productivity and make their works consistent. In this case, business process could be ameliorated to coordinate resource and connect numerous tasks. Thus, changing business process might link handoff points, clarify the linkage between two activities and establish feedback loops among different tasks (Harmon, 2007).

Nevertheless, in fact, the business process would confront lots of other problems, for example, poor business rules, lack of information, ineffective inputs, bad decisions, and unnecessary activities performed (Morgan, 2002). These problems call for business process change to modify or redesign the complex process architecture. Therefore, business process change can assist process restructure to conquer the problems.

Thomas (2008) stated there are three levels of business process change: first one is process re-engineering which scans major threats or opportunities in the external business environment and proposes a re-think of the large-scale process at the strategic level; second one is process redesign which focuses on medium-sized processes improvement; third one is process improvement at tactical level, such as a Six Sigma approach. That means the business process change needs to reflect the business requirements and fulfill business objectives.

2.2 Business Process Management

In early 2006, in order to find out and understand the meaning of BPM in practical situations, Business Process Trends Web site carried out a survey among its readers. The respondents were asked:"*What the term "BPM" meant to them.*" (Harmon, 2009, p.12):

- 12% answer:"*a cost-saving initiative focused on increasing productivity of specific work flow processes.*"

- 16% answer:"*a set of new software technologies that make it easier for IT to manage and measure the execution of process workflow and process software applications.*"
- 26% answer:"*a systematic approach to analyzing, redesigning, improving and managing a specific project or program process.*"
- 40% answer:"*a top-down methodology designed to organize, manage and measure the organization based on the organization's core processes.*"
- 6% answer: "*other.*"

2.2.1 Understanding of BPM

Managing business processes could be used to optimize the capability to confront competitions and challenges in fluctuated business environment (Harmon, 2007). For instance, if a company received complaints that the products have not fulfilled their customer's requirements, they will probably discover the problems hiding in the business processes and then modify the processes.

BPM is an essential methodology or strategy that can drive business management agilely and excellently (Cummins, 2008). It is a widely diffused approach to make the organization achieve effectiveness and efficiencies through creating and ameliorating its business processes based on its business strategies, objectives, and requirements (Weske, 2007).

BPM focuses on finding out appropriate process solutions for supporting an organization's management through utilizing different types of analysis, such as simulation, verification, process mining, and process combination (Weske, 2007). For example, when a company plans to provide a new kind of product, in order to satisfy consumer's demand, they have to realize that this product is the result of a series of activities performed. Furthermore, it is of great significance for the company to observe these processes and activities. Liking Chang's opinion (2006), BPM can give a

blueprint to layout organizational processes. Hence, BPM is based on the observation of business processes.

In addition, BPM impulses collaboration and communication and links variety of activities. Hall (2006) pointed that "*communication depends upon information flowing between people, and as such, the role and nature of codification within this process remains an important topic for research in organizations.*" Hence, collaboration and communication are vital elements in the business management. Their situation is leading an organization to obtain their benefits or not. To reach an efficient and effective management, people also play an important role in controlling those processes. From this angle, it is kind of collaboration between process and peers. Colleagues can interact with each other so that they could achieve the result more efficiently and effectively. So the upstream and downstream processes can be connected with each other. Eliminating or avoiding the gap between processes and people can be based on this BPM characteristic. Therefore, BPM is an important business management method.

2.2.2 The Phases of BPM

Weske (2007) proposed that BPM can be divided into five levels, which ranges from the highest level business strategies to implemented business processes.
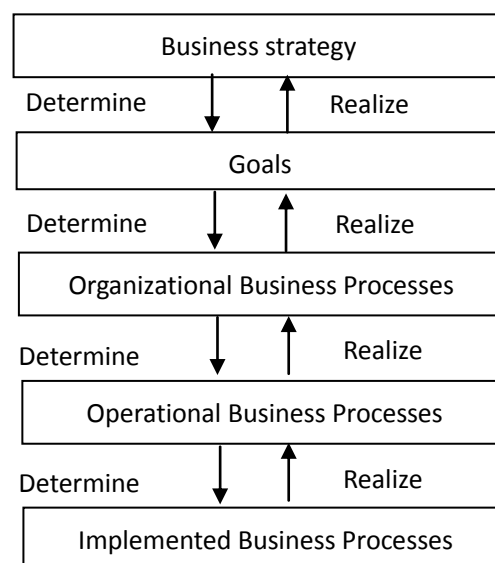
Figure 2.2 Phases of business processes: from business strategy, goals, organizational business processes, operational business processes to implemented business processes (Weske, 2007, pp.18)

Everything should start with a strategy because it guides an orientation for business development, otherwise, doing the work without a target is just wasting time and hard to get expected outcomes. It is just as Montgomery's strategy concept (2008, pp.2):

> *"What we have lost sight of is that strategy is not just a plan, not just an idea; it is a way of life for a company. Strategy doesn't just position a firm in its external landscape; it defines what a firm will be. Watching over strategy day in and day out is not only a CEO's greatest opportunity to outwit the competition; it is also his or her greatest opportunity to shape the firm itself."*

Therefore, a strategy should be articulated at first. Gaining a long-term and sustainable competitive advantage usually requires a specific business strategy. Business performance management (Turban, *et al.*, 2007) is a method that could be used to select, evaluate and fix the business objectives and strategies of the company. A large amount of relevant information is selected to support the improvement of the future performance. Once the strategic business objectives (SBO) have been built, the business process should be adjusted according to the SBO so that it could adapt to the company's strategy.

At the second level, after the business strategy is adopted, it will be divided into operational goals, which can be organized and divided into sub goals (Weske, 2007). These sub goals will affect the business processes.

Harmon (2007) pointed out that business processes are an important concept to facilitating this effective collaboration and consequently help to achieve the business goals. Hence, it is important to make sure that the company's employees and other resources could cooperate and collaborate effectively and efficiently.

The knowledge worker will become more directly involved in the performance and improvement of process execution and management. This will bring the often requested, but rarely realized, continuous process improvement and innovation closer to reality.

At the third level, some organizational business processes will be built, so as to achieve the goals that have been adopted in the second level. These processes, as Weske (2007) illustrates, are "*high-level processes that are typically specified in textual form by their inputs, their outputs, their expected results*". These organizational business processes often have an interrelationship among each other.

At the fourth level, activities within these processes will be specified as well. Organizational business processes could have some general ideas, characteristics or functions, which need to be realized and achieved through designing operational business processes (Weske, 2007). That is to say, operational business processes are more precise and detailed than organizational business processes. They are interrelated and possibly dependent on each other. Besides, operational business processes are fundamental to the designing and developing implemented business processes.

At the implemented level, a business process model may be established to assist BPM goals and strategy. In this phase, firstly, it represents a viewpoint of the real world; secondly, it can (re)structure the business process based on the business objectives to realize business value; thirdly, it is easy to set business planning due to a mature business model (Weske, 2007).

Weske (2007, pp.17) stresses that "*business processes are specified by business process models*". For example, especially, when conducting knowledge management, an organization could (re)use business process model for training and learning. Once a new business process model is being created, it is necessary to analyze and compare the current processes and past processes so that a wide range of elements that affect the business processes could be found out. After being screened, these elements can be

classified into several types, such as elements effectively affecting the process, or elements that need to be modified etc... Finally, the new business process model can be built up with them.

From the above perspective, knowing business process model is to understand and elucidate the measures and the variables existing in the processes. As-Is and To-Be process analysis will help organizations refine their current inputs and predict outputs of process (Jeston & Nelis, 2006). To achieve this aim, gathering data on time is required and then it is necessary to estimate how much time should be used to accomplish the task.

Moreover, to clarify the function of business process models, business process model notation (BPMN) could be applied as a good tool. In general, business process model notation is used to design business process models for showing structure of business processes reflected business needs (Bridgeland & Zahavi, 2008). It is also a way to conduct simulation, such as what-if and semi-structured problem analysis. Because simulation does no harm to the real management and visualize the business processes, BPMN could react to uncertain elements.

In a word, these five steps illustrate the process of creating the implemented business process from setting the company's business strategies. In figure 2.2, it is not difficult to find that each level will influence and even determine the next level, which by contrast will reflect the higher levels. As a result, higher levels should be designed carefully so that the development of lower levels will be less complicated.

2.2.3 Agility of BPM

As mentioned before, an organization should adapt to changing business environment and reflect efficient actions to catch their opportunities. In this case, this is a characteristic of agility which enables an organization manipulate business parameters and variables to implement the latest strategies (Cummins, 2008). For example,

manufacturing has a diversity of business processes and links to other realms. A risk of changing exists in each process. Thus, agility is one of essential elements for business management.

Implementing BPM is a way to establish an agile organization. Cummins (2008) stated that BPM is a method to aggregate redundant business operations, improve visibility of the product line and make processes consistent. It can supervise business processes and identify the business activities quickly to control the changing risks. Furthermore, automated business processes enhance the execution and operation of an agile organization and manage quality of operation procedure, such as six sigma method (Harmon, 2007) and Rummler-Brache nine box (Rummler & Brache, 1995), so that the process management realizes excellent business performance finally.

2.2.4 Knowledge management and BPM

Sveiby (1996) defined that knowledge is an activity which would be better described as a process of knowing. Morey (2002) considered strategy, process, and measurement are important for knowledge management. KM makes up of a series of actions in the organization, such as discovering, representing and sharing the knowledge and information (Turban, *et al.*, 2007). In this case, it could encourage enterprises to elicit valuable insights and experiences from their staff. Thereby, KM could encourage the innovation and enhance the collaboration among the staff.

Above all, KM is an important issue in an organization because the information and the experience will become knowledge as tactic or explicit one stored in the repository to be reference for next production cycle. Nevertheless, BPM clarifies the business process architecture and produces appropriate information flows during the processes. In fact, these information can become kind of knowledge which needs to be stored and managed. In 2006, Gottschalk proposed his point on BPM and KM and explained the interrelationship between them through their lifecycle analysis. Figure 2.3 shows their interrelationship.
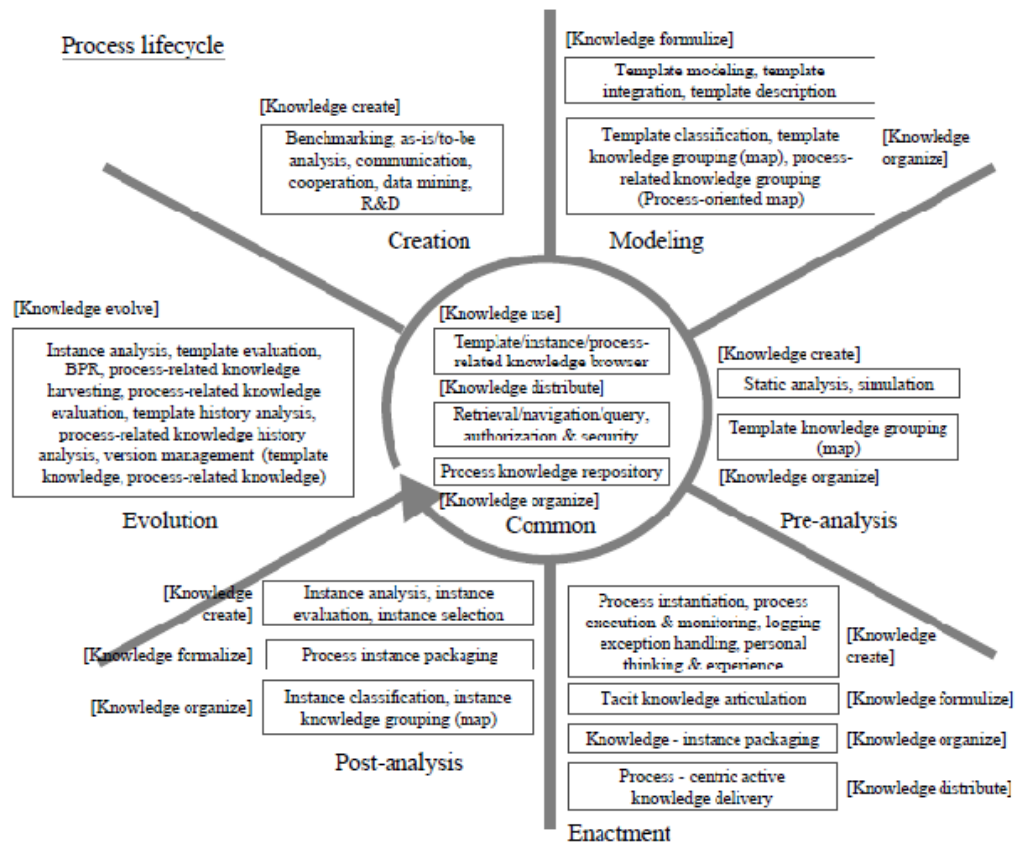
Source: Gottschalk (2006)

Figure 2.3: The interrelationship between BPM and KM (Gottschalk, 2006)

First step of process management is to create and analyze As-Is and To-Be process modeling through process mining and formal process knowledge. And then, formulating the process architecture is based on related knowledge and process analysis which should align with business rules and compliance requirements. Actually, BPM analysis can assist knowledge (re)arrangement and convey transparent knowledge from upstream process to downstream process. After analyzing, knowledge will be articulated and delivered as a packaging under process execution and monitoring. Later, evaluating process instance packaging should be done. Then, based on formal analysis, template and process-related knowledge will evolve. Finally, the step will continue to engage into the first step. From these lifecycle phases' view, a BPM can be embedded in KM as KM does for supporting each other. They can clarify each other and specify business management procedure logically.

2.3 Business Process Management System

Weske (2007) pointed out that BPM is often used with technologies and it is triggering the development of technology. Later, Harmon (2007) mentioned that many vendors entered the BPMS market and began to provide products and services in 2003. In 2003, Gartner suggested that BPMS vendors earned around $500 million dollars. Gartner now projects that the market for BPMS will exceed $1 billion by 2009.

2.3.1 Important functions of BPMS tools

Cummins (2008) proposed his idea about BPM tools:

> *"the available BPM tools range from unsophisticated tools that record a business process in a simple format, with no links to other processes, to tools that are extremely sophisticated, linking processes, sub-processes, an overview of an organization, high level value chains, the re-use of sub-processes, on server-based central repository technology.(Cummins, 2008, pp.282) "*

The use of BPM tools and applications make it much easier and convenient to control and manage the business process. Companies could choose to utilize various types of separated BPM tools or software applications, the synergy of these methods will provide a lot of help. Blokdijk (2008) proposed that a BPM system usually consists of different kinds of tools and applications that are helpful for developing and adjusting the BPM plans and processes. For instance, BPM system tools could be included in the BPMS and its main function is to automate, define, and manage processes. A BPM definition tool could be used to define the objectives of process management and simplify this process.

Business processes could be modeled by BPM tools and languages (Weske, 2007). Liking business rules, Prolog language and entity-relationship diagram design and simulate business processes across the organization automatically and quickly. That shows a particular adoption of relevant technology is useful for executing business process.

Also, BPM system can provide the functionality of business process models, which could simulate the process based on the practical situation by using relevant information (Cummins, 2008). It is a major benefit and characteristic of BPM system. It might be able to help the company deal with the some complex problems. By using simulation, the cost and the lost will probably be significantly reduced.

However, as for BPM system vendors, it is not easy to build up a functional BPM system. Therefore, some kinds of develop tools as well as work flows are necessary (Cummins, 2008). Currently, not all the companies are applying BPM system. To some degree, it might be able to provide complete solution for process managers and business analysts. Companies need to have a defined process management system so that they could improve their productivity and effect positive changes in their business process management.

Cummins (2008) considered that the integrated processes tools can handle the operational actions, manipulate and improve the effectiveness, and develop their strategies. According to these functions, Jeston and Nelis (2008) summarized BPMS components which contain process modeling and (re)design tools, process engine, process simulation, business rule engine, business activity monitoring, document management, customer relationship management, business process repository and enterprise application integration. All of them could enhance the business intelligence and automation.

2.3.2 Benefits of BPMS

BPMS's functions will bring benefits to attract people to adopt it. Firstly, Jeston and Nelis (2008) mentioned that the standard BPMS will perform a clear business process for employees and make them operate and implement their responsibility automatically and easily so that BPMS improves their working productivity. Secondly, web-based technology has been used in BPMS so that the information flow will be conveyed to right place to right person in right time (Cummins, 2008). This is very important

because the information flow has its lifecycle. New information will be updated in time too. Thirdly, BPMS provides managers a way to understand the business processes so that they can manipulate them and govern the related resources more effectively (Cummins, 2008). The business process models will also help them have an integrated overview of the business processes. Fourthly, BPMS offers process documentation that can be considered as an improvement base level because up-to-date process documentation is beneficial for automation and it permits the organization to follow their internal and external regulations (Cummins, 2008). Finally, BPMS supports process simulation (Cummins, 2008). This tool will allow the organization to simulate the business processes for design or redesign with finding out their process weaknesses. It can select the best solution from many of alternatives without increasing the management cost and detect the business environment changing, in order to adjust their objective and strategy in time.

As mentioned before, there are three levels of business management: strategic, tactical, and operational level. Harmon (2007) argued that at strategic level, the enterprise tools will synthesize the data and the information from lower levels to support their development strategies, such as the entry into new markets, acquisitions, and coalition, in order to guide and improve day-to-day decisions. The tools would categorize the tasks and activities and make them consistent so as to establish a steady working relationship between the business processes and different management levels (Harmon, 2007). For example, the strategic level focuses on how the processes connect with each other and supervise the business performance. Thus, the tools would align the goals and the objectives to define managerial processes. At the tactical level and the operational level, the tools would measure and manipulate the processes to examine reliability, responsiveness, flexibility, cost and assets in the business process framework (Harmon, 2007). Furthermore, Harmon (2007, p.145) said "*what you measure is what you get.*" Also, the management standards and measurements will affect employees' behavior and productivity. The applied tools would intensify the business management in every detailed step.

What's important is that BPMS adoption will increase the degree of business process management automation (Cummins, 2007). BPM software can scan and analyze activities automatically and completely. Taking a business rules engine for example, the employee just structures the business rules and inputs the variables into rule model software, such as Visual Rules, and then the decision results would be shown in seconds.

2.4 Adoption and Diffusion

As a new concept, in general, it spends a long period to let it to be accepted and adopted. Some people would like to accelerate this development speed and they may think how to increase the rate of diffusion of an innovation (Rogers, 2003). Rogers (2003, pp.5) defined diffusion as a particular type of communication that "*the process by which an innovation is communicated through certain channels over time among the members of a social system.*" Diffusion is to plan and implement new ideas extension program through effective communication.

In this research, BPMS is as an innovation information system in the recent years. Due to its characteristics and properties, these may give rise to let people to spread this information technology. This leads us to analyze and understand BPMS's advantages, disadvantages, and how it works when it is going to be adopted in different organizations. These elements will have impact on an organization's decisions whether adopt a system or not. Thereby, the next section will give possible answers to elucidate the factors behind BPMS adoption and diffusion, through formal theoretical research.

2.5 Possible Factors Affecting BPMS Adoption and Diffusion

The formal sections introduce each important concept regarding business process, business process change, business process management, knowledge management, and business process management system. Further, in section 2.5, the possible factors

affecting BPMS adoption and diffusion will be found and proposed from these perspectives. Figure 2.4 shows the structure of literature review.
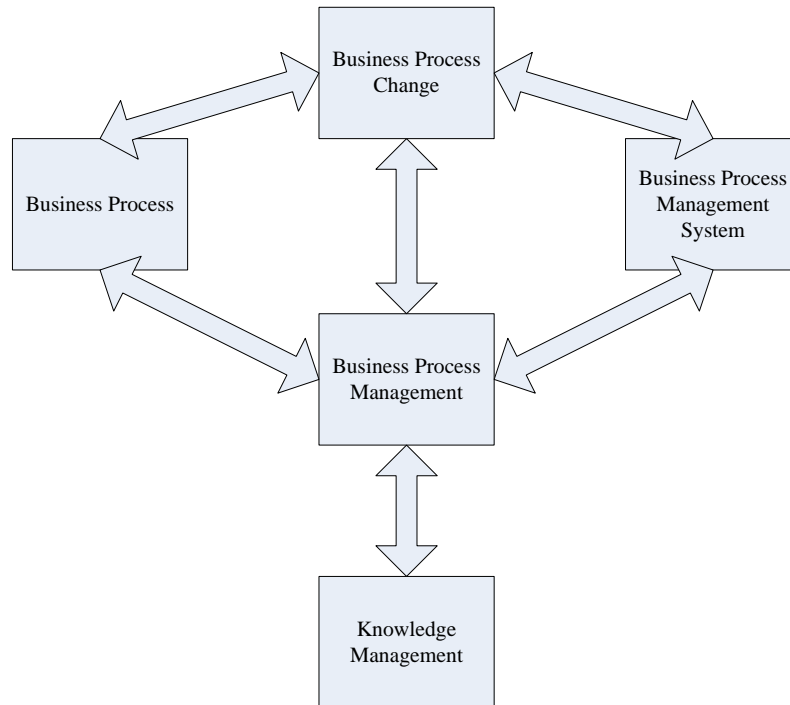
Figure 2.4: Literature Review Structure

From this structure, business process concept is extracted as the first part in theoretical studies because this idea is the basic definition for the whole structure. Value chain, as a mature business concept, specifies the concrete business process structure so that it can give an articulated process architecture as an example to make everybody understood and elucidate how important to streamline the business processes from one aspect. Business process can lead to two crucial areas: business process change and business process management. They trigger and encourage BPMS development because they are theoretical foundations. Their characteristics must have great impact on BPMS adoption and diffusion. By virtue of the relationship among them, we should consider and investigate business process change and BPM situations and properties. As mentioned before, KM and BPM can support each other and KM is also a very critical and indispensable methodology in business management. Integrating KM and BPM

together might be a reason behind BPMS adoption and diffusion. However, KM doesn't have influence on BPMS directly.

We put forward two questions and summarize the literature review to answer these questions so that we could extract possible factors affecting BPMS adoption and diffusion (section 2.3.2):

1. Why does an organization adopt BPMS?

a. BPMS aids business process modeling based on business compliance requirements and real business environment. Business organizations prefer to diagnose, establish and monitor business process aligning with their goals, initiatives, and strategies avoiding the gap between departments and functions. They also prefer to define the business process framework to have a standard architecture and at the same time the standard one could confront any change and can be modified in time.

b. BPMS assists business process and workflow automation. Nowadays, increasing productivity and shorting production cycle is to enhance company's competition. Thus, if the business process can be operated automatically, it curtails time cost and even human resource cost.

c. BPMS can deal with model application and analysis immediately. Thus, business analysts and business process practitioners can depend on this software to support business process architecture design and redesign.

d. BPMS can provide a business process repository. This function can capture and store the business process knowledge, such as process diagrams, results of sessions, and so forth. Moreover, it could guarantee the consistent and efficient data for each business activity.

e. BPMS can integrate processes, sub-processes and all the information escaping redundant information and useless processes. Especially, for documentation

process, it can increase the document quality and validity. Thus, it can streamline the business process and execute variety of activities. As a result, advanced business process is to ensure a consistent workflow.

f. BPMS can scan internal and external business environment and keep track of changes in the process architecture, in order to create and maintain the business process framework in an organization. The amount of data and the relationship between activities are included in process diagnosis.

g. BPMS simulates the business processes. The company can check different alternatives which one is the best solution and examine the process under the complex constraints and environment. Also, the company could rely on this function to identify their weaknesses and bottlenecks in the processes or sub-processes.

h. BPMS can compare and evaluate the strategic goals and the real outcomes so that it may find out what measures have influence on the large-scale business process—value chain.

i. BPMS provides relative constant standard process architecture. If an organization carries out the same activity in different locations, it is good to establish the same but the optimized framework for employees. Also, the standard process can reduce employee training times and make others easily understood.

j. BPMS ensures the real time data and information. Given this reason, each employee could get the latest news immediately to reflect appropriate action.

2. Why doesn't an organization adopt BPMS?

Because BPMS is a new system concept based on BPM theory, maybe people have used some parts of BPMS but they don't know what BPMS is or people haven't used it

before. Nowadays, the process-centric organization starts to be a familiar idea in business management. So, parts of people might never hear BPMS before. Thus, this reason might be an obstacle for BPMS diffusion.

BPMS provides relative standard process architecture. However, there is a dilemma situation. Right, it can give a standard workflow which may curtail the employee training cost and time. But when the business process confronts the changes, BPMS can inspect these issues and alter or redesign process. In this case, it requires employees have high level of knowledge and technological skills. Therefore, it may take too much time to train employees how to use it.

Definitely, BPMS application cost will be an important factor to impact its adoption. How much money spent in implementing and maintaining BPMS can be accepted by an organization. In other words, an organization will concern that BPMS could bring how large benefit margin for them.

3 Research Methods

3.1 Data collection

The main purpose of this study is to figure out the factors that can affect the adoption and diffusion of BPMS. Therefore, in this study, the first task is to make a literature review. It is necessary to learn and understand the theoretical knowledge of this topic before carrying out the investigation. Any content that is relevant to the Information system and BPMS should be taken into account. Several theories are illustrated and discussed, such as business process, business process management and then business process management systems. By summing up some definitions, characteristics, benefits, as well as disadvantages, several factors could be outlined based on these theories and all of these factors will be used to form the questions of the survey.

After determining to use questionnaire as the approach of survey, what we have discovered during the literature review are used to construct the questionnaire, which will be handed out to a large number of companies all over the world. As a matter of fact, there are many factors that might have an influence on a company's decision. Some of them, in practical situations, are critical factors, which are always taken seriously. As a consequence, in order to figure out which of those factors are really of great significance in deciding to apply a BPMS, a large number of companies will be invited to participate in this survey. The opinion provided by one or two companies will not be convincing. Therefore, in this way, it will be possible for us to test and examine whether the factors found in literature review really have an influence on the BPMS adoption.

When it comes to the approach of doing a survey, two most common methods are the questionnaire and the interview. At the beginning of this study, we intended to use both of these two methods. However, as the purpose of this study has become more and more specific, compared with face-to-face interviews and telephone interviews questionnaire is preferable.

3.1.1 Why questionnaire?

There are a wide range of approaches that can help investigators collect information or responses to their research questions. The questionnaire, of course, is one of these methods. It can be made up of open questions and closed questions.

Gillham (2000) has compared questionnaire with other qualitative methods, such as interviews, and then described the differences, advantages and disadvantage of questionnaire.

First of all, questionnaire is less time-consuming and also it costs much less than making an interview (Gillham, 2000). In this study, opinions or experiences of one or two companies are definitely not enough, because every company has their special and unique characteristics and their points of view cannot reflect the factors affecting BPMS adoption in general. That is why a large number of companies are selected to be the respondents. In this situation, however, it is almost impossible to contact every company and ask them to accept an interview. Firstly, there are no more than three weeks to complete this survey. Even if there are companies willing to provide help and accept the interview, discussing about the time and place of the interview will take a lot of time. Besides, companies usually have their own schedules. It is difficult to ensure that their time schedules are always suitable. What's more, the locations of the selected companies are far away. Most of them are in foreign countries. If interview is selected as the survey method, a large amount of time will be spent on contacting and transporting to other places, even other countries.

Making an interview through telephone is also a way to conduct the survey (Gillham, 2000). Compared with carrying out a face-to-face interview, this method saves a lot of money. This cost will be much less than travelling. However, it still does not seem to be a good way to carry out the survey, since it will cost too much time on making phone calls and getting in touch with the right person. The person who will answer the telephone probably will not be the one that we hope to interview.

Therefore, compared with face-to-face interview and telephone interview, questionnaire is the preferable. The most significant advantage of questionnaire is that it saves much time (Gillham, 2000). Now that there are only three weeks to accomplish the survey and we have a large number of companies to investigate, questionnaire seems to be the most efficient method. It can help us to collect a great deal of information in a short time. For instance, it is possible to send out several hundreds of questionnaires in the time that is spent on making only one interview (Gillham, 2000).

Meanwhile, respondents will be provided more convenience as well. They can choose to complete the questionnaire when time is suitable (Gillham, 2000). So our respondents will have three weeks to finish this questionnaire. The only thing that needs to be ensured is to send the questionnaire to them as early as possible. Moreover, there are some companies who are not willing to be interviewed (Gillham, 2000). During an interview, they will probably feel some pressure or uncomfortable when they need to give an instant response. For example, they might need some time to think about the questions or they want to ask their colleagues from different departments for some opinion or suggestions concerning the system they are using. If they are not quite sure how to answer the question properly, it will be embarrassing. However, by contrast, questionnaire can effectively avoid this problem. Respondents can do anything they want when thinking of how to answer the questionnaire.

Secondly, closed questions are used. As a consequence, answers will be provided so that respondents could read the questions and make a choice. Respondents do not need to think how to answer the question or how to give a response. What they need to do is to think of the answers that have been given, and then select the one that they think could best describe their situation or their points of view.

On the other hand, using closed questions makes the analysis process much easier. Gillham (2000) stresses that when making the analysis investigators could classify the responses collected, and then find out their frequency. As a result, some diagrams, such

as tables, bar charts, pie charts or some line graphs, could be utilized to express the results of the survey. Furthermore, software such as Excel and SPSS will be useful to do the calculation and produce some diagrams. After that, an explanation will be added to each diagram, and all of the explanations will finally be used to draw a conclusion.

Thirdly, the anonymity of respondents can be protected. Gillham (2000) pointed out that some respondents feel much freer when they participating in an anonymous style of survey. But the anonymity always brings another serious problem. How to know who has given a response? If the identity is truly needed, highlighting that no identity will be published is necessary. If not, who has answered the questionnaire will not be necessary to find out. Before sending out the questionnaire, the group respondents could be carefully selected and screened. After visiting and screening a large number of websites that concern BPM and BPMS, fortunately some famous BPM and BPMS vendors have been found. Only those who are professional in the field of BPM and BPMS will receive the questionnaire. In this sense, the quality effectiveness of the responses could be enhanced.

Fourthly, questionnaire can be used to collect information that is helpful for testing or supporting a hypothesis as evidence (Gillham, 2000). Before carrying out the survey, several factors that affect the BPMS adoption and diffusion have already been figured out. We have already had some ideas about the results. The questionnaire is made up of these factors and it aims to test whether our hypothesis or prediction is correct.

Besides what have been mentioned above, questionnaire does have some defects. For instance, low response rate is one of the most serious problems (Gillham, 2000). For example, thousands of questionnaires have been sent out, but only about one hundred responses can be collected finally. Moreover, whether respondents can finish it on time cannot be controlled (Gillham, 2000). As for investigators, it is difficult to check whether the respondents have taken the questionnaire seriously. It is impossible to find out whether the answers are given honestly as well.

Gillham (2000) points out that usually designers of the questionnaire may fail to explain the purpose of the survey or specify why their answers are needed, what the information collected will be used to do. Making a good description of the questionnaire will be helpful for making respondents more serious and honest when giving their answers. And also it might be able to increase the response rate as well as the quality of the answers.

3.1.2 Target group selection

In order to ensure the quality of the responses, it is necessary to make sure that the respondents who will receive the questionnaire must be familiar with BPM or BPMS. Generally, there are two parts of the target group. One is the group of BPMS vendors; the other is companies who have been applying BPMS or are planning to implement BPMS. Since many web sites of the BPMS vendor have provided their customer list, it is convenient to find out which companies have adopted this system. In this way, we are able to the fix the group of BPMS users. Besides, email is the main approach to get in touch with these companies.

3.2 Questionnaire design

Before design each question, the questionnaire, which is expected to collect high-quality and accurate information, should be thought of and carefully planned (Brace, 2008). The topics and themes that will appear in the questionnaire should be covered completely. Brace (2008) suggests that the sequence of questions and the sequence of the responses that are given dramatically influence the validity and reliability of the survey. In addition, the "routing" needs to be carefully planned as well, so that the respondents just need to give responses to the questions relevant to them; however, in contrast, those questions they do not need to be asked are not necessary to answer (Brace, 2008).

Drafting the individual question is always an arduous process. Inevitably, the questions

need to be modified and rewritten time and time again. When answering the questionnaire, respondents cannot be offered any help, therefore the questions must be understandable; otherwise they would probably choose to finish the questionnaire incompletely or misunderstand the questions.

Although questionnaire possesses some conspicuous advantage, it does have some weakness. Designers must be cautious when constructing the individual question, so as to eliminate the cumulative negative effects to the greatest extent (Brace, 2008).

Totally, our questionnaire consists of 15 questions, which primarily concentrate on four parts: foreword, basic information of the respondent and his/her company, BPM in the company, and the use of BPMS in the company.

3.2.1 Foreword

The first part is foreword. It tells respondents who we are, what the survey's topic and objective, welcome them to attend the investigation, and make an information contract with them which should promise we will not use and publish their private information and no identity will be shown. Moreover, all the issue should be described more attractively in manner way. Thus, the following sentences were used as the beginning of the questionnaire: (Appendix I)

> "Welcome to participate in this questionnaire! It will not take you more than 10 minutes, but your contribution is very important for our empirical study. Nowadays, business process management (BPM) becomes a hot topic and its related technology is developing quickly. A business process management system (BPMS) is designed to manipulate and optimize business process based on BPM methodology. The purpose of this survey is to investigate the factors that affect the adoption and diffusion of BPMS. The questionnaire is made up of 15 questions. Participation is voluntary. The survey is anonymous and thus your private information will be protected and no identity will be published. The survey analysis results will be used in our master thesis in informatics at Lund University in Sweden.

If you have any question, please do not hesitate to contact us by e-mail or phone:

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Wenqiong Cui: wenqiong.cui.175@student.lu.se +46-762520238"

3.2.2 Questions about basic information

In the second part of the questionnaire, four questions regarding the basic information are raised. Although there is no need to know which company responds to the questionnaire, their primary business of industry and the size of their company will be taken into account when doing the data analysis. These four questions also play key roles in screening the respondents and examining whether they possess the eligibility for participating in this survey. It will be helpful to judge whether their responses is reliable and valid according to the answers of these four questions.

In addition, each question is designed in the questionnaire has it special function and connotation.

Question 1. Please select the field that best describes the primary business of your industry.

Question one is to investigate the primary business of respondent's industry. These industries have been illustrated. They are consulting services, financial services or banking, government, health care, insurance, manufacturing, petrochemical, publishing, retail or wholesale, telecommunications, transport and storage, utilities, and others. In light of numbers of different industries, thus, we set "others, please specify..." to obtain the accurate information. This is a multiple choice question but only one answer can be selected. Different industries have distinctive business process needs. However, the same industry may have more common characteristics. Thereby, collecting this background information is needed.

Question 2. Please select your organization size.

It is necessary to record organization size because organization size may have impact

on the degree of complexity of organization business activities and management. In common, organization size can be categorized into three groups: small, medium, and Large. These three sizes have been set as options. While this question might be questioned by this classification, everyone has his or her standard view to estimate the organization size. However, we can't ignore the organization size definition in different industries. For example, even two companies have the same number of employee but it is hard to say they are the same scale. Thus, every company should have their own perspective to describe their organization size based on their industry. For this reason, we think it is better to use "small, medium, and large" scale rather than to choose the number of employees.

Question 3. Please select your organization location.

Furthermore, question three is to gather the location information of organizations. The respondents might come from different places. Different locations should have different cultures, ideas, and behaviors. Thus, different locations' situation can be compared with each other. We set Africa, America, Asia, Europe, and Middle East as five options.

Question 4. Please select your job position.

Question four is to collect the respondents' job position. Our target group is who has knowledge and experience in BPM or BPMS. Definitely, they play diversity of roles in their organization. Thus, the job position is important information. For another issue, job position would ensure this questionnaire's validity and help to analyze the following data from different roles' perspective. Thus, the job positions are: business analyst, business or line of business manager, executive, HR manager, IT and business management consultant, IT developer, IT manager, Process Practitioner, and others. Given that the list cannot include the whole different position, this question is designed as open and closed one.

3.2.3 Questions concerning BPM

The third part mainly focuses on the characteristics of BPM. In this part, the answers

collected could be used to figure out which factors or features companies concern most about BPM because BPM is management methodology and BPMS's outlook is based on BPM development. That's why these findings will be a significant part of the reason why they purchase and use BPMS.

Question 5. Which level of management does your organization's BPM focus on?

The reasons for designing this question are in the following elaboration. As known, there are three levels in business management: strategy/executive level, tactical level, and operational level (Turban, *et al.*, 2007). In section 2.1.1, we have deepened the business process understanding. Cummins (2008) considered the process focuses on a unit of work which should be done. Most of understanding recognizes that the process consists of series of activities. In this case, it can be figured out that for managing a process in detail, BPM pays more attention to business management at operational level—day to day management of an organization. Nevertheless, the top managers also have their own daily work which needs to be arranged in order. In section 2.2.2, BPM is described from the highest level business strategies to implemented business processes. It is possible that by virtue of diversity of working software today, in different management level would use different types of software to support their works. From this question, we plan to know BPM is often used in which level. Thus, we set three options: leadership/Executive level, tactical level, and operational level. These options can be selected more than one answer.

Question 6. Do you think BPM is a useful business management methodology?

The answer options are "Yes" or "No". This question is to figure out the respondents' attitude about BPM. This design will tell us whether BPM works in daily business management rather than just does in theoretical environment. If the answer is "Yes", the respondent could continue to do question 7; otherwise, he or she can skip to question 8.

Question 7. Why do you consider BPM as a useful approach? (Multiple Answers)

This question is to find the reasons why the respondents consider BPM as a useful

approach. From those reasons, what factors is most important to impulse BPM spread could be found out. The question is a close and open one again. The reason list comes from the formal literature review. In section 2.2.3 and section 2.2.4, the possible reasons could be concluded. They are:

- Identifying business activities

- Keeping business processes up to date

- Making business processes consistent

- Modeling standard processes for the value chain

- Ordering business activities logically

- Providing automated business process

- Performing high quality of information during communication and collaboration procedure

- Unifying and integrating business activities

- Supporting knowledge management

- Other (please specify)

Question 8. Please evaluate the following statements about the reasons why your organization pay attention to business process change. Besides each statement, please select the level of your agreement, from strongly disagree (1) to strongly agree (6)

This question is to delve into business process change which is discussed in section 2.1.3. Also, from our literature review framework (Figure 2.4), business process might be required to change so as to adapt new business environment. Some characteristics of business process change will have influence on BPMS properties reflected on real business process needs. Thus, we draw some probable statement to let the respondents evaluate them, from strongly disagree to strongly agree in six scale, to find what they care and how much degree they agree with them. These statements come from section 2.1.3:

- Creating new products requires a business process change.

- Improving existing products requires a business process change.

- Business process change can reduce costs.

- Business process change is helpful for remaining or enhancing competitive advantages.

- Business process change can improve the quality of business processes.

- Business process change can enhance the capability of business process manipulation

- Business process change can increase customers' satisfaction and keep their loyalty.

- Business process change can accelerate organizational responsiveness.

- Business process change can optimize the resource planning and management.

- Business process change can increase productivity.

- Business process change can increase the agility of business process.

- Business process change provides new profit opportunities.

- Business process change can help the company obey compliance requirements.

- Business Process change ensures that the business process can adapt to the business strategy.

3.2.4 Questions regarding BPMS

The fourth part is used to investigate the situation that how BPMS works in the companies and how they find the BPMS. We combine different types of questions, including single choice, multiple choices as well as rating scales.

Question 9. Do you have a plan to deploy BPMS?

Well, the group target is selected from vendors' customers. In view of different kinds of information system products, it is hard to say their customers must be utilizing BPMS in the organization, although the majority of vendors only focus on BPMS products. Thus, this question can ensure the effectiveness of the questionnaire result and increase the degree of availability of the questionnaire feedback. Under this situation, it is good for us to collect and analyze the data from different group who has been already adopted BPMS, who plans to use BPMS in the future, and who has no plan to apply it. The following questions can be answered by different group and not every question is

suitable for each group. The respondents, from an organization which has applied BPMS, can show their experience on utilizing BPMS; the respondents who have no experience in using BPMS may tell us why they don't intend to apply BPMS or what they expect after adopting BPMS.

Question 10. What was your responsibility when your organization intended to purchase BPMS related services and solution?

If the respondent has answered "Yes" in question 9, he or she can go on to do this question. Knowing their responsibility, when their organization purchases BPMS, is good for us to estimate what they focus on and how much degree of their knowledge about BPMS. The three roles are designed: determine business process needs, evaluate BPM products or services, and implement BPM products or services, and others. In terms of other roles which we have omitted, we set others to let respondents specify.

Question 11. What is your budget for implementing and maintaining BPMS expected in 2010?

For the options, four selection domains have been formulated. First is less than $100,000 or $100,000; second is $100,000-$500,000, including $500,000; third is $500,000-$1 million, including $1 million; final is more than $1 million. We expect to know how much money they will accept for implementing BPMS. The cost is always as a big issue to influence user's decision.

Question 12. Please evaluate each of the following software tools and choose the level of their importance for your business process management from very unimportant (1) to very important (6).

As known in section 2.3.1, the literature review guides us know many components of BPMS. They are BAM-real time process monitoring tools, business rule management tools, business process repository, business process modeling tools, document management tools, enterprise application integration products, process analysis and redesign tools, process simulation tool, performance metrics tool, and workflow

systems. Further, we want to delve into how important they are in their organization and what kind of software characteristics will be emphasized on. Thus, a scale is used again to let the respondents evaluate them so that we may find the motivation why they use it based on software tools' characteristics. What's more, we add a blanket as an open question to be commented in order to complement our missing.

Question 13. If you have deployed BPMS, please assess the following statements about the benefits of BPMS and select the level of your agreement, from strongly disagree (1) to strongly agree (6). (If you answer this question, you don't need to answer question 14.)

This question is directly to ask BPMS user about the benefits they have been received. Their answers are more persuasive to elaborate the advantages of BPMS. The options are the factors which have been extracted from the literature review in section 2.3.2 and section 2.5:

- BPMS helps your organization to inspect internal and external environment in time
  BPMS assists automated workflow management
- BPMS simulates the business process to identify process weak points and resource bottlenecks so as to provide the best alternative efficiently
- BPMS integrates and streamlines business processes
- BPMS ensures that each employee can acquire and deal with up-to-date information
- BPMS provides a stage for managers with insight into the business processes to obey compliance requirements
- BPMS can cope with business process change so that it makes your organization more flexible
- BPMS guarantees quality of information and reduces redundant and inconsistent data
- BPMS assists your customer services to obtain higher customer satisfaction
- BPMS reduces your management costs

These statements have to be estimated in six scales and a comment blanket has been set again. The reason is the same as the question 12.

Question 14. If you haven't deployed BPMS, please indicate why you don't use it. (Multiple Answers)

From this question, we try to find why they have no plan to use BPMS and what kind of reasons is as an obstacle to limit BPMS diffusion. We can abstract and illustrate some reasons from the literature review in section 2.5:

● I have never heard of BPMS before

● A BPMS requires employees to have high level of knowledge and technological skills

● A BPMS costs too much

● It takes too much time to train employees to use it

If there are other reasons, the respondent could fill the comment blanket to specify.

Question 15. If you are interested in our research, please write down your e-mail address. We will provide our report and outcomes of the investigation.

Because the respondents may be interested in this investigation result or feedback and they have right to know the result and conclusion, this open question will let them write down their contact information.

3.3 Ethical issues

Beauchamp and Childress (1994) defines that "*Ethics is a generic term for various ways of understanding and examining the moral life*". As is pointed out by Kvale and Brinkmann (2008), ethical issues are necessary to be taken into account. It does play significant part in the survey.

During the investigation, probably most participants want to get assurances that their information will not be revealed (Brace，2008). They may refuse to give a response to

the questionnaire if they are not provided comprehensive description of the survey, for example, who is doing this research and carrying our this investigation, a good explanation of why they are invited to participate in this survey, why their opinions are needed etc...

Informed consent and confidentiality are important factors discussed in ethical guidelines for researchers (Kvale & Brinkmann, 2008). In order to obtain informed consent, usually before carrying out a survey, researchers should comprehensively specify all the relevant information in a comprehensible language, including the purpose of this research, which methods would be applied, what kind of risks they may encounter as a respondent, what kind of inconveniences might be brought to them, what kind of benefits as well as possible outcomes could be offered to the potential participants, so as to gain the informed and voluntary consent.

As for the confidentiality, most of our respondents are commercial enterprises, and they may care more about the information they provide. Therefore, it has been explicitly claimed in the questionnaire that no identity will be published and the questionnaire is completely anonymous. Hence, they do not need to worry about where their information would be stored or who might get access to their information etc...

In addition, Kvale and Brinkmann (2008) also stress that no matter doing an interview or a questionnaire it should be ensured that participants have the right to withdraw from the research at any time. The willingness of participants to play a role in the research is the essential principle of ethical research. In our questionnaire, it has been clearly claimed that the respondents can withdraw at any time (Kvale & Brinkmann, 2008).

3.4 Research validity and reliability

For both qualitative research and quantitative research, validity and reliability are of great significance in ensuring the survey outcomes accurate and precise. The

conclusion of this study, to a large extent, is affected by the reliability and validity of the questionnaire, which keeps on producing a series of numbers. The conclusion of our research will be made based on the outcomes of the survey. Therefore, it is obliged to keep cautious during the process of survey, so that the final results could be trusted. Furthermore, the validity of the questionnaire is related to the reliability. Once the results of the survey is not reliable and cannot be trusted, there is no need to consider about the validity. It does not make any sense at all to discuss whether the false data is valid or how to make sure the results more valid when they are not true. As a consequence, first and foremost reliability should be ensured.

So as to enhance the reliability of this research, the target group is selected from BPM vendors and their clients. In this way, at least we can make sure that our respondents are those who are interested in or even familiar with the topic of BPM and BPMS. Some of them may probably have professional knowledge or experiences of using BPMS.

The only method to contact the target group is email. By using this way, we can make sure that only companies belonging to the target group could receive our questionnaire. That is to say, it has not been sent to any irrelevant people or company, which might give a response to the questionnaire even though they have never heard of BPMS. In contrast, for those who are relevant to our study, it is obliged try to contact them, although it will be very difficult. In this sense, the reliability of the answers we collect could be increased.

Email, however, as the way to get in touch with the company does have some negative points. It is impossible to know who is responsible for checking the email in the company. Some of the companies have provided different email addresses on their web sites, in which people can decide who they are going to contact. However, some other companies provide only one email address. When sending the questionnaire to this kind of companies, it is indispensable to clarify and request for their assists in forwarding the email to their colleagues who are familiar with BPM or BPMS. Besides, some

screening questions have been raised at the beginning of the questionnaire. Brace (2008) has highlighted the significance of screening questions. These questions could be helpful for screening whether the respondents belong to our target group and whether they are eligible for participating in this investigation. For instance, in our questionnaire, respondents are asked to select their job position in their company. If a response showing that the respondent is a sales staff who has nothing to do with BPM in his company and he complete all the questions in the questionnaire, then his answers will probably be unreliable and invalid.

Another factor affecting the reliability of the survey is the sample size (Anderson, *et al.*, 2007). If the sample size has not been taken into account, to some degree the reliability of this survey will be suspected. Thus, we have selected a large number of companies all over the world as our target group.

Moreover, reliability and validity do have some relationship with the questions themselves. Gillham (2000) suggests that when answering the questions respondents may encounter some literacy problems, such as they cannot understand what the question really asks or they may misunderstand the questions. In this situation, although they may responses after a long and deep consideration, their answers are not really the results that need to be gathered. As a result, all technical words are dodged. Instead, the questions are made up of only simple sentences, so as to evade problem of misunderstanding.

Moreover, the questionnaire for this study totally contains 15 questions, which can be completed in 10 minutes. If it takes the respondents too much time to answer to many questions, they will probably feel too tired and bored to finish all the questions seriously and carefully. Thereby, the reliability and validity are substantially affected. Given this kind of situation, we try to make the questionnaire succinct and easy to read.

Although the style of questions are closed question, in most of them a choice that respondents could express their own points of view has been provided. By using this

type of questions, accordingly, besides testing whether the survey outcomes align with our "hypothesis" some new issues and factors will probably be discovered.

When comes to scale questions, the credit from 1 to 6 rather than from1 to 5 because it is necessary to avoid the personal preference issue. For example, in Sweden, most of people may like to choose the middle score which is hard to obtain their opinion on a statement. Thus, we use odd even numbers of scales to carry out the survey to guarantee the reliability.

Finally, when making the online questionnaire, one IP address can only give one response, so that we could avoid one company or even one respondent gives duplicate answers. It is also helpful for ensure the reliability and validity.

4 Data Analysis

This chapter focuses on the analysis of the survey data. It will be divided into four sections according to different types of questions.

4.1 Analysis approach

In total, 316 companies all over the world have been invited to participate in this online survey. The responses rate is 15.5%. More precisely, 49 available responses have been collected within 10 weekdays. As a matter of fact, this study is quite time-critical, and there is no time to wait for more responses. Therefore, 49 responses are used for the data analysis. Table 4.1 specifies the detail information of the respondents of this survey, including industry, company size, location and the job of the respondents.

Table 4.1: Summary of respondents' information

Industry	Size	Location	Job Title
Transport and Storage	Medium	America	Business Analyst
Consulting Services	Large	America	IT and business management consultant
Health Care	Medium	Europe	IT and business management consultant
Government	Large	Mid East	Process Practitioner
Consulting Services	Medium	Europe	Executive (CEO, CIO, CFO, etc...)
Consulting Services	Large	Asia	IT and business management consultant
CRM services	Medium	Europe	Business Analyst
Financial Services or Banking	Medium	Africa	Business Analyst
Insurance	Large	Europe	Process Practitioner
Insurance	Medium	Europe	Enterprise Architect
Consulting Services	Large	Asia	Business Analyst
Tool vendor	Small	Asia	IT Manager
Consulting Services	Small	Europe	IT and business management consultant
IT	Small	Europe	Executive (CEO, CIO, CFO, etc...)
Retail or Wholesale	Medium	Europe	IT Architect
Insurance	Medium	Europe	SOA Architect
Open Source Software support	Medium	Europe	IT Developer
Utilities	Small	Asia	IT Developer
Consulting Services	Large	Europe	Business Analyst
travel technology provider	Small	Europe	Executive (CEO, CIO, CFO, etc...)
Insurance	Large	Europe	IT Developer
Agribusiness	Medium	Europe	Executive (CEO, CIO, CFO, etc...)
Retail or Wholesale	Small	Europe	solution specialist

Consulting Services	Small	Europe	IT and business management consultant
Financial Services or Banking	Medium	Europe	IT and business management consultant
Insurance	Small	Europe	Executive (CEO, CIO, CFO, etc...)
Manufacturing	Large	Asia	Process Practitioner
Financial Services or Banking	Large	Europe	Process Practitioner
Consulting Services	Small	America	Executive (CEO, CIO, CFO, etc...)
Manufacturing	Large	Europe	IT and business management consultant
Consulting Services	Medium	Asia	Process Practitioner
Consulting Service	Medium	America	SAP Consultant
Financial Services or Banking	Large	Asia	IT Manager
Transport and Storage	Small	Europe	Business Analyst
Utilities	Medium	Asia	Process Practitioner
Transport and Storage	Medium	Asia	Business or Line of Business Manager
Telecommunications	Medium	Asia	Process Practitioner
Financial Services or Banking	Small	Africa	accountants
	Medium	Asia	HR Manager
web design	Small	Asia	IT Developer
Telecommunications	Medium	Asia	IT Manager
Financial Services or Banking	Large	Europe	Business or Line of Business Manager
Manufacturing	Small	Europe	Process Practitioner
Manufacturing	Large	Asia	Business or Line of Business Manager
Manufacturing	Large	Asia	sales
Consulting Services	Small	Europe	Executive (CEO, CIO, CFO, etc...)
Consulting Services	Small	Africa	Business or Line of Business Manager
Consulting Services	Large	Europe	Managing director Sweden and Denmark
Consulting Services	Small	Europe	HR Manager

When analyzing the survey data, Microsoft Excel and SPSS are used calculate and sum up the statistical data. In a large number of quantitative methods, mean value, standard deviation and frequency distribution are used to make the analysis for this study.

First of all, the frequency has been calculated to show the numbers of each answer option. The numbers of times each answers have been selected are calculated, which provide more insight and make it more easy to understand the survey data. Furthermore, bar charts are used to provide a more direct and clear illustration.

Secondly, the calculation of mean value and standard deviation is another main method. Mean value is the average number and it could be used to show the location. Standard deviation is often used to measures of variability of all the survey data. The mean and

standard deviation can be used to determine the relative location of all the items in the questionnaire (Anderson *et al.*, 2007).

Although there are many other statistical methods, frequency distribution, mean and standard deviation are the main methods used to analyze the survey data, since these are the most suitable method for this research. For instance, hypothesis testing is also important quantitative approach. However, it is not suitable for this study. Because hypothesis testing focuses on testing the alternative hypothesis by carrying out the sample study and calculating the sample data (Anderson *et al.*, 2007). When using this way, two hypotheses will be formulated, which are null and alternative hypotheses. In this study, there is not any hypothesis and thereby this method is unavailable.

4.2 Analysis of basic information

In our questionnaire, Question 1, 2, 3, and 4 are concerning the information about the respondents and the companies. The result of each question will be illustrated respectively.

Question 1 asks the respondents' primary business. Generally, 49 respondents have participated in this survey, in which 40 of them select the answer options that have already been given and 9 respondents specify their answers.

Table 4.2: Question 1

Please select the field that best describes the primary business of your industry:		
Answer Options	**Response Percent**	**Response Count**
Consulting Services	32.5%	**13**
Financial Services or Banking	15.0%	6
Government	2.5%	1
Health Care	2.5%	1
Insurance	12.5%	5
Manufacturing	12.5%	5
Petrochemical	0.0%	0
Publishing	0.0%	0
Retail or Wholesale	5.0%	2
Telecommunications	5.0%	2

Transport and Storage	7.5%	3
Utilities	5.0%	2
Other (please specify)		9
	answered question	**49**

Number	**Response Date**	**Other (please specify)**
1	May 11, 2010 8:41 AM	web design
2	May 13, 2010 7:05 PM	Software Development
3	May 14, 2010 10:19 AM	Agribusiness
4	May 14, 2010 1:37 PM	travel technology provider
5	May 17, 2010 6:17 AM	software vendor
6	May 17, 2010 6:29 AM	Open Source Software support
7	May 17, 2010 4:35 PM	IT
8	May 17, 2010 10:14 PM	Tool vendor
9	May 18, 2010 9:08 AM	CRM services

A large number of companies in various industries are selected as our survey sample. The first question asks the primary business of industry. As can be seen in Table 4.2, it is not difficult to find that 32.5% respondents are working in Consulting Services Companies and this number is much higher than the number of financial services or banking companies, which occupy a proportion of 15%. Besides, the number of insurance companies and manufacturing enterprises has the same percentage of 12.5%, which is a little bit less than the financial services companies or banks. Consulting service companies are providers of the BPMS but not the user. However, when contacting them through email, we have found that they had answered the questionnaire with reference to their customer perspectives and feedbacks, which is of great significance for this study.

In addition, among the 49 responses, there are 9 respondents chose "others". Table 4.2 also shows the detail of the answers, including the time when answers were given. Most of them are in the field of information technology.

Question 2 focuses on the size of respondent companies. Totally, 49 responses are received, and no one skipped this question.

Table 4.3: Question 2

Please select your organization size:		
Answer Options	**Response Percent**	**Response Count**
Small	32.7%	16
Medium	36.7%	18
Large	30.6%	15
	answered question	**49**

From Table 4.3, it is easy to find that the number of medium companies is bigger than the other two numbers. More precisely, among these 49 respondents 18 companies are medium whereas the number of larger companies and the number of small companies are 16 and 15. After filtering the answers, the following outcomes have been found.

● As for the small companies: 5 of them plan to use BPMS; 4 of them have no plan to use it; 6 of them have already applied a BPMS.

● As for the medium companies: 5 of them plan to use BPMS; 2 of them have no plan to use it; 10 of them have already applied a BPMS.

● As for the large companies: 1 of them plans to use BPMS; 6 of them have no plan to use it; 7 of them have already applied a BPMS.

Therefore, based on what have been described above, we may conclude that BPMS can be adopted by companies of different scales. As for a company, no matter it is small, large or medium it would be able to find a suitable system to support their business processes.

Question 3 aims to collect the data of their locations, and thereby it could be helpful for analyzing the differences of affecting factors among companies in different areas.

Table 4.4: Question 3

Please select your organization location:		
Answer Options	**Response Percent**	**Response Count**
Africa	6.1%	3
America	8.2%	4
Asia	30%	15
Europe	53%	26
Middle East	2%	1

answered question	**49**
skipped question	**0**

As can be seen from Table 4.4, 53% companies of respondents are located in Europe. This number is much larger than the others. After filtering the data, the following result could be found:

- In 26 European companies, 14 of them have already applied BPMS; 3 of them plan to use BPMS; and 9 of them do not plan to use BPMS.

- In 15 Asian companies, 7 of them have already applied BPMS; 4 of them plan to adopt BPMS; and 2of them have no plan to use it.

Question 4 is about the job title of the respondents. By asking this question, we will be able to judge how much the job of the respondent relates to BPM and BPMS. In general, 49 responses are collected, in which 9 respondents specify their job titles that are not included in the answer options.

Table 4.5: Question 4

Answer Options	Response Percent	Response Count
Business Analyst	14.6%	6
Business or Line of Business Manager	9.8%	4
Executive (CEO, CIO, CFO, etc...)	17.1%	7
HR Manager	4.9%	2
IT and business management consultant	17.1%	7
IT Developer	9.8%	4
IT Manager	7.3%	3
Process Practitioner	19.5%	8
Other (please specify)		9
	answered question	**49**

Number	Response Date	Other (please specify)
1	May 11, 2010 1:45 AM	sales
2	May 11, 2010 2:03 AM	**Sales**
3	May 11, 2010 8:51 AM	**accountants**
4	May 12, 2010 4:01 AM	**SAP Consultant**
5	May 13, 2010 7:05 PM	**solution specialist**
6	May 17, 2010 6:53 AM	**SOA Architect**
7	May 17, 2010 7:55 AM	**IT Architect**
8	May 18, 2010 7:28 AM	**Enterprise Architect**
9	June 3, 2010 7:12 AM	**Managing director Sweden and Denmark**

According to Table 4.5, it is not difficult to infer that most of the survey participants are familiar with BPM and BPMS. More specifically, among the respondents of this survey there are 8 process practitioners, 7 business management consultants, six business analysts, 7 executives, and 4 business managers. All of them should be more or less experienced about BPM and its related systems. Besides, there are several IT developers, IT managers, and HR managers as well. If their companies have adopted BPMS, these people are probably the users of this system. For one thing these four questions are used to collect some basic information of the survey participants, for another we need these questions to screen data. For instance, as has been found in the results of this survey, the accountant from a small financial service company has given responses to the questions about BPM. However this respondent skipped all the questions about BPMS, which is not so relevant to the job of accountant. Therefore it could be concluded that this respondent does not know much about BPMS, and the responses may not be reliable or valid either. Consequently these answers are ignored when making analysis of the factors affection BPMS adoption and diffusion, in order to ensure the reliability and validity.

4.3 Analysis of questions concerning BPM

This part consists of three questions regarding BPM.

As for Question 5, totally 46 answers have been gathered. Three respondents skipped this question.

Table 4.6: Question 5

Which level of management does your organization's BPM focus on? (Multiple Answers)		
Answer Options	Response Percent	Response Count
Leadership/Executive Level	43.5%	20
Tactical Level	43.5%	20
Operational level	78.3%	36
Other (please specify)		2
	answered question	**49**
Number	Response Date	Other (please specify)
1	May 14, 2010 10:19 AM	Part of multinational group where system are designed centrally in many layers

2	May 17, 2010 6:53 AM	IMHO "Leadership/Executive Level" is critical for successful BPM, unfortunately we don't have it
3	June 3 , 2010 7:12 AM	We do not leverage BPM process, but still focus on optimizing our business processes

As can been seen in Table 4.6, operational level is the most favorable choice of the users, which accounts for 79%, whereas the percentages of Leadership/executive level and tactical level are much lower, which are both 43.5%.

As for this question, the number of available responses is 49.

● 7 respondents selected all three levels. 5 of them have already adopted a BPMS and the other 2 are planning to use a BPMS.

● 4 respondents selected Leadership/executive level and tactical level. 1 has already adopted BPMS, 1 is planning to use it, and the other 2 have no plan.

● 5 respondents selected Leadership/executive level and operational level.

● 7 respondents selected tactical level and operational level. 5 of them have already used a BPMS, 1 is planning to use it and the other one has no plan.

● 4 respondents selected only Leadership/executive level. 2 of them have already used a BPMS. 1 of them is planning to use this system and the other has no plan.

● 2 respondents selected only tactical level. 1 of them has already adopted BPMS while the other is planning to do so.

● 17 respondents selected only operational level. 7 of them have applied BPMS. 4 companies are planning to use BPMS, and 6 do not intend to adopt it.

Operational level has drawn much more attention. However, it does not mean that the other two levels are unimportant. As is shown in the table, one respondent selected "others" and provide a specific responses, which stresses the importance of leadership/executive level and expresses their strong eager to possess it. As a consequence, different types of companies may concentrate on different management levels. They will probably select the management approach or systems according to their own characteristics and requirements.

Question6 asks the respondents opinion about BPM. Totally, 47 answers have been received; in which 43 of them consider BPM as a useful business management methodology, occupying 91%. In these 43 companies, 22 of them have already used BPMS, and 9 of them are planning to adopt it. The other seven, however, do not plan to use this system at present.

In contrast, 9% of the users give negative answers to this question. Among those who do not think BPM is useful, 4 companies do not plan to use BPMS and the other one company has already adopted BPMS.
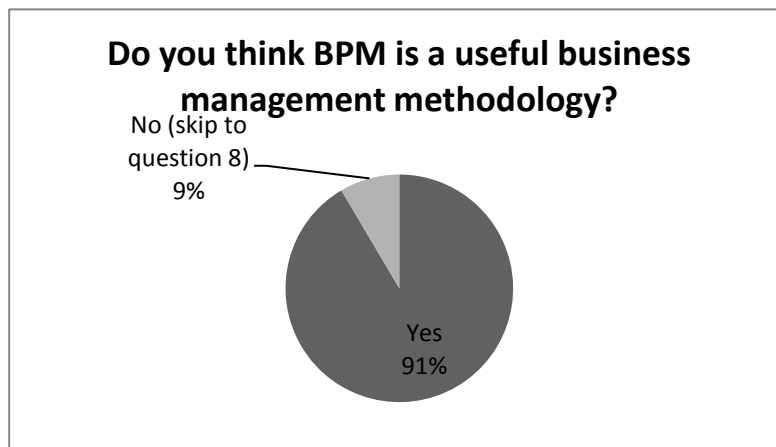
Figure 4.1: Is BPM a useful business management methodology?

Question7 is discussing the reason why BPM could be considered as a useful business management method. 49 available responses have been collected and the data is summarized in Table 4.7.

Table 4.7: Question 7

Why do you consider BPM as a useful approach? (Multiple Answers)		
Answer Options	Response Percent	Response Count
Identifying business activities	52.2%	24
Keeping business processes up to date	58.7%	27
Making business processes consistent	58.7%	27
Modeling standard processes for the value chain	41.3%	19
Ordering business activities logically	28.3%	13

Providing automated business process		52.2%	24
Performing high quality of information during communication and collaboration procedure		43.5%	20
Unifying and integrating business activities		47.8%	22
Supporting knowledge management		50%	23
Other (please specify)			3
		answered question	**49**
Number	**Response Date**	**Other (please specify)**	
1	**May 13, 2010 7:05 PM**	Agility - being able to change and adjust things while they are running	
2	**May 17, 2010 6:29 AM**	Consistent handling of human and automatic activities	
3	**May 17, 2010 6:53 AM**	Modeling business processes in a unified way helps capturing and describing these processes in a common way which helps individuals in the organization understand processes from other departments/fields, which, up to now, have been described in plenty different methods and formats.	

The top three advantages of BPM are "keeping business processes up to date", "making business processes consistent" and "identifying business activities". Up to 58.7% respondents chose "keeping business processes up to date". This result leads us to conclude that the most significant benefit and function of BPM is to keep business up to date. In addition, "supporting knowledge management", "identifying business activities" and "providing automated business process" are also distinct advantages, which are chosen by more than 50% respondents.

Besides, Table 4.7 shows that relatively fewer respondents choose "supporting knowledge management", "communication and collaboration procedure" and "unifying and integrating business activities". "Ordering business activities logically" is the least favorable choices, amounting 28.3%. Thus, we may conclude that this issue is not significant reasons why companies use the approach of BPM.

Table 4.7 also specifies the detailed answers given by the respondents who chose "others". "Agility" is highlighted as an important factor. As is described in the theoretical studies, agility is one of essential elements for business process management. Moreover, modeling business processes and human and automatic activities are supplemented as the reason for the significance of BPM as well.

4.4 Question regarding Business Process Change

Table 4.8: Question 8

Answer Options	1	2	3	4	5	6
1. Creating new products requires a business process change.	3	9	14	9	8	4
2. Improving existing products requires a business process change.	3	6	14	11	8	5
3. Business process change can reduce costs.	1	0	4	8	20	14
4. Business process change is helpful for remaining or enhancing competitive advantages.	0	0	3	5	23	16
5. Business process change can improve the quality of business processes.	0	0	4	10	24	9
6. Business process change can enhance the capability of business process manipulation	0	2	10	21	7	6
7. Business process change can increase customers' satisfaction and keep their loyalty.	1	1	7	18	14	6
8. Business process change can accelerate organizational responsiveness.	0	1	6	16	14	10
9. Business process change can optimize the resource planning and management.	0	2	8	7	22	8
10. Business process change can increase productivity.	0	2	4	10	18	13
11. Business process change can increase the agility of business process.	0	2	7	12	18	8
12. Business process change provides new profit opportunities.	0	6	11	12	12	5
13. Business process change can help the company obey compliance requirements.	0	2	8	11	12	14
14. Business Process change ensures that the business process can adapt to the business strategy.	0	2	5	15	18	7

Table 4.9: Mean & Std. deviation of Quesiton 8

Statement	Case No.	Mean	Minimum	Maximum	Std. Deviation
1	47	3.47	1	6	1,381
2	47	3.64	1	6	1,374
3	47	4.87	1	6	1,076
4	47	5.11	3	6	,840
5	47	4.81	3	6	,851
6	46	4.11	2	6	1,038
7	47	4.30	1	6	1,082
8	47	4.55	2	6	1,039
9	47	4.55	2	6	1,100
10	47	4.77	2	6	1,088
11	47	4.49	2	6	1,081
12	46	3.98	2	6	1,220
13	47	4.60	2	6	1,210

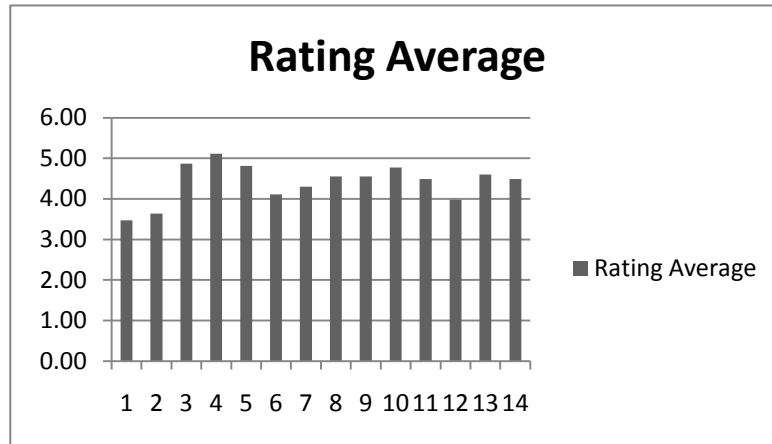| 14	47	4.49	2	6	1,019

Figure 4.2: Frequency of statements

From each statement average score, the top five reasons which encourage people to focus on the business process change are remaining or enhancing competitive advantages, reducing costs, improving the quality of business processes, increasing productivity, and optimizing the resource planning and management. The statement 4's mean is the top one and its standard deviations are smaller than one. Thus, we think this factor is the most important of reason. But for the statement 3, its standard deviation is larger than that of the statement 5, although their means are close to each other. That means that it is obvious distinguish between people's opinion about the statement 3. Thereby, the statement 5 is much more important than the statement 3.

4.5 Questionnaire regarding BPMS

Table 4.10: Question 9

Do you have a plan to deploy BPMS?		
Answer Options	**Response Percent**	**Response Count**
Yes, we have already adopted BPMS.	48.9%	23
No, but we plan to use BPMS in the future. (Skip to question 11)	23.4%	11
No, there is no plan. (Skip to question 14)	27.7%	13
	answered question	**47**
	skipped question	**2**

From Table 4.10, these companies can be divided into three small groups. The first one contains 23 samples; the second on includes 11 samples; the third one has 13 samples. In terms of different groups, the following answers could be analyzed by different angles. Unfortunately, there are 2 samples have skipped the question. For these 2 samples, we cannot believe other answers concerning about BPMS are reliable or valid.

Table 4.11: Question 10

What was your responsibility when your organization intended to purchase BPMS related services and solutions?		
Answer Options	Response Percent	Response Count
Determine Business Process Needs	16.7%	4
Evaluate BPM Products or Services	45.8%	11
Implement BPM Products or Services	37.5%	9
Other (please specify)		5
answered question		29
skipped question		20

Number	Response Date	Other (please specify)
1	May 11, 2010 2:03 AM	user
2	May 14, 2010 10:19 AM	Part of multinational group where system are designed centrally in many layers
3	May 17, 2010 6:17 AM	NA
4	May 17, 2010 6:53 AM	All of them. But we started with a small project and are moving BPM to a broader field now
5	May 17, 2010 8:34 PM	We have own system

The table above describes each responder's responsibility when they were acting their role in BPMS implementation. In light of their different roles, they may have particular view about BPMS. It continues to categorize the survey group and help us to analyze the following answers. From the table above, there are 29 which are bigger than 23 answers. Maybe other 6 responders estimate their role when their companies implement BPMS in the future. We consider the respondent whose company have plan to implement BPMS as a condition to make a cross table.

Table 4.12: Question 10

What was your responsibility when your organization intended to purchase BPMS related services and solutions?			
	Do you have a plan to deploy BPMS?		
Answer Options	**No, but we plan to use BPMS in the future. (Skip to question 11)**	**Response Percent**	**Response Count**
Determine Business Process Needs	1	16.7%	1
Evaluate BPM Products or Services	5	83.3%	5
Implement BPM Products or Services	0	0.0%	0
Other (please specify)			0
		answered question	**6**
		skipped question	**5**

The Table 4.12 demonstrates our formal assumption that the respondents estimate their roles in the future. However, this mistake has no influence on the final conclusion at all.

Table 4.13: Question 11

What is your budget for implementing and maintaining BPMS expected in 2010?		
Answer Options	**Response Percent**	**Response Count**
Less than $100,000 or $100,000	54.5%	18
$100,000-$500,000, including $500,000	30.3%	10
$500,000-$1 million, including $1 million	6.1%	2
More than $1 million	9.1%	3
	answered question	**33**
	skipped question	**16**

It reflects how much money will be invested by customers. The majority of clients prefer to spend less than $100,000 or $100,000. As mentioned before, the company may assess BPMS implementation will bring how much margin benefits for them. However, we are interested in three companies which may invest more than $1 million. Their primary industries are financial services or banking, government, and health care. Financial service or banking and government organizations are large organization scale. Health care organization is medium one.

Table 4.14: Question 12

Please evaluate each of the following software tools and choose the level of their importance for your business process management from very unimportant (1) to very important (6).									
Answer Options	**1**	**2**	**3**	**4**	**5**	**6**	**Rating Average**	**Response Count**	**Standard Deviation**
1. BAM -real time Process monitoring tools	4	3	5	6	9	7	4.00	34	1.651
2. Business rule management tools	2	4	6	10	9	3	3.85	34	1.351
3. Business process repository	1	4	5	9	8	7	4.18	34	1.403
4.Business Process Modeling tools (e.g. BPMN 2.0)	1	3	5	6	7	11	4.45	33	1.481
5. Document management tools	0	5	3	11	9	6	4.24	34	1.281
6. Enterprise Application Integration products	2	3	4	10	11	4	4.09	34	1.357
7. Process analysis and redesign tools	2	4	4	9	5	10	4.21	34	1.572
8. Process Simulation tool	2	5	5	7	8	7	4.03	34	1.547
9. Performance metrics tool/system	1	0	4	11	13	5	4.47	34	1.080
10. Workflow systems	0	0	2	9	16	7	4.82	34	0.834
Other (please specify)								2	
answered question								**34**	
skipped question								**15**	

Number	**Response Date**	**Other (please specify)**
1	**May 13, 2010 7:05 PM**	CEP - Complex event Processing (trends over time windows) Exporting or Round tripping between the BPMN logical process model and the executable (i.e. BPEL) version. Full OASIS standards support is very important.
2	**May 14, 2010 10:19 AM**	Part of multinational group where the analysis was done centrally. (I don't know the details behind)
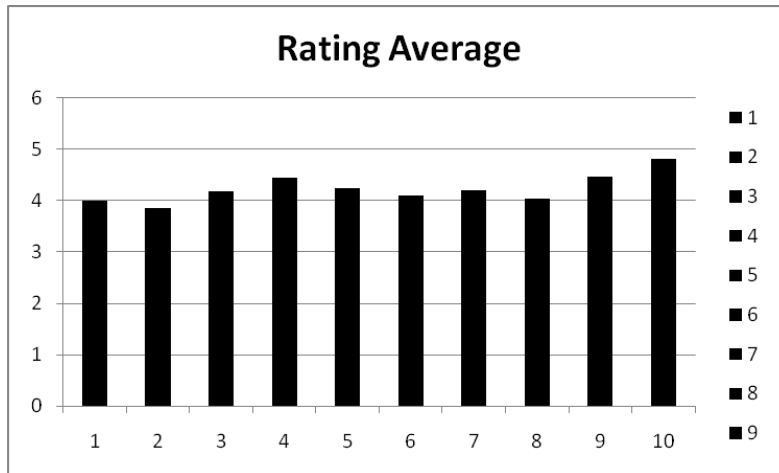
Figure 4.3: Average rating for each statement

We can see workflow system is recognized as the most important tool for their companies and its standard deviation is very small so that the evaluation score is much more stable rather than big fluctuating range. The following important tools are performance metrics tools, business process modeling tools, document management tools, and process analysis and redesign tools. They are the top 5. On the other hand, about BAM, there are four respondents recognize BAM is not important for BPM as initial expect. At the same time, one respondent specifies CEP, Exporting or Round tripping, and OASIS standards supports.

As for Question 13, 29 available responses have been collected. Rating average and standard deviation are calculated to analyze the answers.

Table 4.15: Question 13

If you have deployed BPMS, please assess the following statements about the benefits of BPMS and select the level of your agreement, from strongly disagree (1) to strongly agree (6). (If you answer this question, you don't need to answer question 14.)									
Answer Options	**1**	**2**	**3**	**4**	**5**	**6**	**Rating Average**	**Response Count**	**Std. Deviation**
1. BPMS helps your organization to inspect internal and external environment in time	0	1	6	7	6	1	4.00	21	1.000
2. BPMS assists automated workflow management	0	0	2	5	8	6	**4.86**	21	0.964
3. BPMS simulates the business	0	2	3	9	5	2	4.10	21	1.091

process to identify process weak points and resource bottlenecks so as to provide the best alternative efficiently									
4. BPMS integrates and streamlines business processes	0	0	1	5	11	4	**4.86**	21	**0.793**
5. BPMS ensures that each employee can acquire and deal with up-to-date information	0	0	2	12	5	2	4.33	21	0.796
6. BPMS provides a stage for managers with insight into the business processes to obey compliance requirements	0	1	4	5	9	2	4.33	21	1.065
7. BPMS can cope with business process change so that it makes your organization more flexible	1	1	4	7	4	4	4.14	21	1. 352
8. BPMS guarantees quality of information and reduces redundant and inconsistent data	0	0	6	9	4	1	4.00	20	0.858
9. BPMS assists your customer services to obtain higher customer satisfaction	0	0	3	8	6	3	4.45	20	0.945
10.BPMS reduces your management costs	0	0	8	3	5	5	4.33	21	1.238
Other (please specify)								2	
answered question								**21**	
skipped question								**24**	

Number	Response Date	Other (please specify)
1	**May 13, 2010 7:05 PM**	Not all BPMS are created equal. Some will perform well only if used together with other stack components from the same vendor

According to Table 4.15, all the mean values of ratings are between 4 and 5. Since the differences among these values are not conspicuous, standard deviation is used to assist to make the analysis when the mean values are same or close to each other.

First of all, answer statement 2 and answer statement 4 are got the highest rating, which are both 4.86. For these two statements, the rating value "5" has been selected most frequently. There are two respondent disagree on the answer statement 2, whereas only one disagree on the fourth one. In addition, when comparing the standard deviation, it is easy to find that answer statement 4 has a smaller value, which is 0.793. It means that the ratings of this answer statement given by all these 21 respondents are closer to the mean value 4.86, while the ratings of answer statement 2 are relatively farther from the

mean value. Since most of survey participants have agreed with these two statements, they could be concluded as the significant benefits of BPMS.

Secondly, answer statement 9 has a rating average of 4.45. The rating value "4" appears most frequently, and there are three disagreements.

Besides, answer statement 5, 6 and 10 have the same mean value 4.33. Thus, the values of standard deviation need to be compared. As is shown in Table 4.15, statement 5 has the smallest value, which is 0.796. Thus, compared to statement 6 and statement 10, the rating values are closer to the mean value. Rating value "4" appears most frequently, and only two respondents disagree. As for question 6, which has a standard deviation 1.065, the most frequent rating value is "5" and there are 5 respondents disagree on this answer. Answer statement 10, however, has the largest standard deviation, which is 1.238. It means that all the rating values are far from the mean value 4.33. It can be seen in the Table that up to 8 respondents select "3", which means disagreement. In this sense, statement 10 cannot be concluded as the benefit of BPMS. It might depend on specific situation of companies, such as the company strength or the BPMS they adopted.

Moreover, the rating average of option 3 is 4.1, which is a little bit less than the rating average of option7. However, option 7 has a larger standard deviation of 1.352, which means this question has much more variable responses. As can been seen in Table 4.15, one respondent selected "1", which equals to "strongly disagree". In total, there are 6 respondents disagree on this option. The rating value "4" is selected most frequently. On the other hand, when analyzing the option 3, it is not difficult to find that, the standard deviation is smaller and all the rating values of this option are close to the mean value. The most frequent rating value is the same as option 7, but two more people select this value. There are 5 respondents disagree on this option, and no one strongly disagrees. Hence, option 7 cannot be conclude as the significant benefit of BPMS. From some companies' perspectives, BPMS succeeds in reacting to the

business process change and enhancing the flexibility. However, by contrast, BPMS in some other companies seems to be failure in this aspect. Option 3 could be taken as the benefit of BPMS, but it is not very significant.

Finally, two options with the smallest rating value of "4" will be discussed. Option 1 has a standard deviation of 1 and a uniform distribution could be seen in the table. Although the rating value "4" has been selected most frequently, up to 1/3 respondents disagree on this option. While as for option 8, the standard deviation is slightly smaller. Most of the values are around "4" and 6 respondents disagree.

When analyzing these survey data, which kind of functions and components the adopted BPMS possess are increasingly significant. One respondent has pointed out that the synergy of different components of BPMS plays a significant part when BPMS is applied.

Question 14 aims to discover the reason why BPMS are not adopted. Only those who have not applied BPMS have responded to this question. In total, 23 available answers are received.

Through analyzing the results of this question, defects and disadvantages of BPMS could be discovered. Consequently it will be helpful to find out factors that deter the BPMS adoption and diffusion.

Table 4.16: Question 14

If you haven't deployed BPMS, please indicate why you don't use it. (Multiple Answers)		
Answer Options	**Response Percent**	**Response Count**
I have never heard of BPMS before	34.8%	8
A BPMS requires employees to have high level of knowledge and technological skills	39.1%	9
A BPMS costs too much	39.1%	9
It takes too much time to train employees to use it	13%	3
Other (please specify)		5

| | | answered question | 23 |
| | | skipped question | 26 |

Number	Response Date	Other (please specify)
1	May 13, 2010 7:05 PM	Change management issue
2	May 17, 2010 4:35 PM	Priorities
3	May 18, 2010 7:28 AM	The process thinking in the organization is not yet mature enough.
4	May 18, 2010 8:03 AM	BPMS is just a tool. BPM is a discipline, mindset, and methodology. Our focus is to know how we do things, not necessarily to deploy process models.
5	May 23, 2010 3:15 PM	There are other ways to implement BPM

As can been seen in Table 4.16, there are 8 respondents chose that they have never heard it before. To some degree, this selection implies that BPMS is still a new tool or product. One respondent has claimed that "the process thinking in the organization is not yet mature enough". This might be the situation in many companies. Before they decide to adopt a BPMS, they need experience a lot of change and adjustment to possess process thinking.

On the other hand, although many companies are familiar with BPM, they merely care about how to use this methodology to make them more effective and efficient. In Table 4.16, one respondent claimed that they need the approach of BPM to help with their job, but not necessarily the tool like BPMS. Indeed, methodology is more important and more widely used than a tool that is used to do things.

Besides, according to the table, 39.1% respondents selected that "A BPMS requires employees to have high level of knowledge and skills". This one appears to be one of the most significant reasons and obstacles that affect the BPMS diffusion.

As is shown in Question 11, majority of survey participants have invested less than $100,000, including $100,000 in adopting a BPMS. While in this question, up to 39.1% participants chose that "a BPMS costs too much". How much benefit could be gained after spending a lot of money on a BPMS is the main problem. If a company intends to

adopt BPMS, they must confront with this risk. Once the use of BPMS cannot bring many benefits, the cost of this system will make the company to suffer a great loss. As a result, it could be concluded that the budget for implementing and maintaining the BPMS is one of the most significant affecting factors.

5 Conclusion

This chapter makes a conclusion to answer the research question in section 5.1. The following sections will present research limitations and further study about BPMS adoption and diffusion.

5.1 Factors affecting BPMS adoption and diffusion

Our thesis purpose was to discover and discuss the factors that affect the adoption and diffusion of BPMS. We have studied previous relevant academic literature to find the possible factors and then carried out the online survey. As the investigation results, we generalize the factors reflected our target group's opinion. Especially, those twenty-three companies, which have being utilizing BPMS, are recognized as persuasive evidences to express their experience on BPMS adoption. On the other hand, the group of those who haven't deployed BPMS yet helps us to figure out the obstructive factors for BPMS diffusion.

We find that the characteristic of integrating and streamlining business processes encourages BPMS adoption and diffusion. This is the most important factor because companies emphasize on the business process quality improvement and want to realize business activities integration; also because the most important software tool for company's BPM is workflow system from our investigation. Workflow systems define a series of activities within an organization to enhance productivity. What's more, one respondent proposed complex event processing used in BPM is a crucial technique for identifying tasks and analyzing the relationship between events in real time. From one aspect, eventually, it coordinates the resource planning and management. Above all, it shows that amount of companies, with high probability, might be eager to clarify their business process and they would like to ask BPMS for help them optimize business process.

The second factor is that BPMS make business process management automated. In our

investigation, the high percentage of people considers BPMS assists automated business process after BPMS application and automated business process is one of important reasons resulting in BPM as a useful methodology. This characteristic would curtail the time consuming and increase working efficiency so as to improve productivity and reflect customer needs quickly. Meanwhile, the people have highlighted that BPMS increases their customer satisfaction compared with the situation before utilizing BPMS.

The third factor is that BPMS ensures that each employee can acquire up-to-date information. This benefit has been proved by the respondents and at the same time, most of respondents hope to achieve keeping business processes up to date as one of vital BPM goals. The real time data may enhance working effectiveness; otherwise, a small change might have influence on the quality of outcomes so that it may distribute the key of working task. What's more important is that every process and every sub-process can obtain the latest information avoiding the information could not be filtered into next process in time. Thus, we think guaranteeing the real time data during every detail process is one of essential reasons to encourage BPMS development and spread its adoption field.

As the fourth factor, BPMS can do business process modeling, analysis, and redesign good enough which enable people to diagnose, establish and monitor business process or its architecture consistent with their strategies and compliance requirements. In fact, managers can supervise every process, visualized by the software, in time. Because they are very caring about their business performance, it is convenient for them to analyze and modify the business process to achieve goals. Therefore, we have reasons to believe this factor can promote BPMS adoption and diffusion.

From above, these four factors are very significant aspects for hastening BPMS adoption and diffusion in our investigation. About other factors, there are great distinguishes among different people because they have different experience on BPMS

implementation. The big standard deviation has presented this situation.

Besides advantaged factors, there are some opposite factors which may limit BPMS diffusion. By virtue of a new system concept, lots of people have no idea what BPMS is about. Meanwhile, the process-centric organization starts to be a familiar idea in business management. One respondent stated that "The process thinking in the organization is not yet mature enough." So some people may think they just need to focus on how do the tasks and there is no necessary to deploy process models.

Moreover, we found people are very concerned about business process consistence and agility of organization which is able to change and adjust events while they are running quoting from a respondent. Indeed, they emphasize on BPM because of these BPM's characteristics. However, in the survey, after adopting BPMS, we discovered one respondent extremely disagree the statement "BPMS can cope with business process change so that it makes your organization more flexible" and also people's perspectives on this statement are great different. Hence, we see that BPMS implementation doesn't achieve the agility good enough every time, even the agility is a very important factor for using BPM methodology. In parallel, the statement that "BPMS guarantees quality of information and reduces redundant and inconsistent data" has been evaluated at 3 or 4 scores by most of people. Luckily, there is no one strongly disagree with this statement. To some extent, BPMS doesn't reach the aim what people expect at a certain high level. With our limitation, we didn't find out and give a concrete reason to explain these issues other than propose that BPMS should promote itself on the agility and consistence issues.

Table 5.1: Summary of Factors

Factors significantly affecting BPMS adoption and diffusion	1. The characteristic of integrating and streamlining business processes encourages BPMS adoption and diffusion.
	2. BPMS make business process management automated.
	3. BPMS ensures that each employee can acquire up-to-date information.

	4. BPMS can do business process modeling, analysis, and redesign good enough which enable people to diagnose, establish and monitor business process or its architecture consistent with their strategies and compliance requirements.
Obstructive Factors	1. BPMS copes with business process change so that it makes your organization more flexible which is not often the same as what the people expect.
	2. It is not always the same scenario as user expect to achieve that BPMS should guarantee quality of information and reduces redundant and inconsistent data
	3. Lots of people have no idea about what BPMS is.
	4. BPMS requires employees to have high level of knowledge and technological skills.
	5. A BPMS costs too much.
Factors moderately affecting BPMS adoption and diffusion	1. BPMS assists your customer services to obtain higher customer satisfaction
	2. BPMS ensures that each employee can acquire and deal with up-to-date information

5.2 Limitation

In this study, limitations mainly exist in the following aspects:

First and foremost, time is not quite enough for carrying out an online survey. After accomplishing the questionnaire, there are only two weeks to collect responses to the questionnaire. A large number of companies related to this subject are selected as the potential participants, which basically consists of BPMS vendors and their customers. In total, 316 companies have been invited to participate in this online survey. Up to now, 49 available responses have been received and the response rate is 15.5%. Because the number of samples is only 49, in which there are only 21 companies who have already adopted BPMS. Thus, it is really difficult to make analysis of the questions about BPMS with this small amount of survey data and draw a valid conclusion. Bias also will be more difficult to avoid. Therefore we merely screen out the factors that have most significant values as our final conclusion.

Besides, in the respondents of this survey, more than 50% companies are located in Europe and nearly 30% companies are located in Asia. At the beginning, besides finding out the factors that affect the BPMS adoption, the other purpose of this

questionnaire is to find out whether there is a different between the affecting factors when comparing companies in different areas. It is encouraged to see that 26 European companies and 15 Asian companies have participated in this survey. However, it is still impossible to make the comparison and discover this difference by using this amount of data. The number of responses from the other locations, such as America, is too small to support this analysis. Therefore, this study can only focus on figuring out the general factors affecting BPMS adoption and diffusion.

5.3 Further study

Since the questionnaire has already been designed for this research and gathered some useful information for the analysis, if this online survey could be continued to collect more responses, the final conclusion of this research will probably be more valuable. More companies or organizations could be invited to participate in this investigation, especially those located outside Europe. Once a large number of participants could give responses to this questionnaire they would be divided into three groups, so that it would be more precise and valid when analyzing their opinions. The analysis could be respectively carried out according to three different situations: those who have already adopted BPMS; those who are planning to adopt BPMS; those who have no plan to use BPMS.

In addition, as has stated above, it would be interesting to compare European companies and American companies and find out the differences of factors that affect the BPMS adoption and diffusion. Once more sample data can be collected the validity of this study will be substantially enhanced.

Appendix I

Factors Affecting Business Process Management System Adoption and Diffusion

Welcome to participate in this questionnaire! It will not take you more than 10 minutes, but your contribution is very important for our empirical study.

Nowadays, business process management (BPM) becomes a hot topic and its related technology is developing quickly. A business process management system (BPMS) is designed to manipulate and optimize business process based on BPM methodology. The purpose of this survey is to investigate the factors that affect the adoption and diffusion of BPMS. The questionnaire is made up of 15 questions. Participation is voluntary. The survey is anonymous and thus your private information will be protected and no identity will be published. The survey analysis results will be used in our master thesis in informatics at Lund University in Sweden.

If you have any question, please do not hesitate to contact us by e-mail or phone:

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1. Please select the field that best describes the primary business of your industry:

- ○ Consulting Services
- ○ Financial Services or Banking
- ○ Government
- ○ Health Care
- ○ Insurance
- ○ Manufacturing
- ○ Petrochemical
- ○ Publishing
- ○ Retail or Wholesale
- ○ Telecommunications
- ○ Transport and Storage
- ○ Utilities
- ○ Other (please specify)

2. Please select your organization size:

- ○ Small
- ○ Medium
- ○ Large

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3. Please select your organization location:

- ○ Africa
- ○ America
- ○ Asia
- ○ Europe
- ○ Middle East

4. Please select your job position:

- ○ Business Analyst
- ○ Business or Line of Business Manager
- ○ Executive (CEO, CIO, CFO, etc...)
- ○ HR Manager
- ○ IT and business management consultant
- ○ IT Developer
- ○ IT Manager
- ○ Process Practitioner
- ○ Other (please specify)

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Factors Affecting Business Process Management System Adoption and Diffusion

5. Which level of management does your organization's BPM focus on? (Multiple Answers)

☐ Leadership/Executive Level

☐ Tactical Level

☐ Operational level

Other (please specify)

6. Do you think BPM is a useful business management methodology?

○ Yes

○ No (skip to question 8)

Factors Affecting Business Process Management System Adoption and Diffusion

7. Why do you consider BPM as a useful approach? (Multiple Answers)

- ☐ Identifying business activities
- ☐ Keeping business processes up to date
- ☑ Making business processes consistent
- ☐ Modeling standard processes for the value chain
- ☐ Ordering business activities logically
- ☐ Providing automated business process
- ☐ Performing high quality of information during communication and collaboration procedure
- ☐ Unifying and integrating business activities
- ☐ Supporting knowledge management
- Other (please specify)

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Factors Affecting Business Process Management System Adoption and Diffusion

8. Please evaluate the following statements about the reasons why your organization pay attention to business process change. Besides each statement, please select the level of your agreement, from strongly disagree (1) to strongly agree (6)

	1	2	3	4	5	6
1. Creating new products requires a business process change.	○	○	○	○	○	○
2. Improving existing products requires a business process change.	○	○	○	○	○	○
3. Business process change can reduce costs.	○	○	○	○	○	○
4. Business process change is helpful for remaining or enhancing competitive advantages.	○	○	○	○	○	○
5. Business process change can improve the quality of business processes.	○	○	○	○	○	○
6. Business process change can enhance the capability of business process manipulation	○	○	○	○	○	○
7. Business process change can increase customers' satisfaction and keep their loyalty.	○	○	○	○	○	○
8. Business process change can accelerate organizational responsiveness.	○	○	○	○	○	○
9. Business process change can optimize the resource planning and management.	○	○	○	○	○	○
10. Business process change can increase productivity.	○	○	○	○	○	○
11. Business process change can increase the agility of business process.	○	○	○	○	○	○
12. Business process change provides new profit opportunities.	○	○	○	○	○	○
13. Business process change can help the company obey compliance requirements.	○	○	○	○	○	○
14. Business Process change ensures that the business process can adapt to the business strategy.	○	○	○	○	○	○

9. Do you have a plan to deploy BPMS?

○ Yes, we have already adopted BPMS.

○ No, but we plan to use BPMS in the future. (Skip to question 11)

○ No, there is no plan. (Skip to question 14)

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Factors Affecting Business Process Management System Adoption and Diffusion

10. What was your responsibility when your organization intended to purchase BPMS related services and solutions?

- ○ Determine Business Process Needs
- ○ Evaluate BPM Products or Services
- ○ Implement BPM Products or Services
- ○ Other (please specify)

11. What is your budget for implementing and maintaining BPMS expected in 2010?

- ○ Less than $100,000 or $100,000
- ○ $100,000-$500,000, including $500,000
- ○ $500,000-$1 million, including $1 million
- ○ More than $1 million

Factors Affecting Business Process Management System Adoption and Diffusion

12. Please evaluate each of the following software tools and choose the level of their importance for your business process management from very unimportant (1) to very important (6).

	1	2	3	4	5	6
1. BAM -real time Process monitoring tools	○	○	○	○	○	○
2. Business rule management tools	○	○	○	○	○	○
3. Business process repository	○	○	○	○	○	○
4. Business Process Modeling tools (e.g. BPMN 2.0)	○	○	○	○	○	○
5. Document management tools	○	○	○	○	○	○
6. Enterprise Application Integration products	○	○	○	○	○	○
7. Process analysis and redesign tools	○	○	○	○	○	○
8. Process Simulation tool	○	○	○	○	○	○
9. Performance metrics tool/system	○	○	○	○	○	○
10. Workflow systems	○	○	○	○	○	○

Other (please specify)

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Factors Affecting Business Process Management System Adoption and Diffusion

13. If you have deployed BPMS, please assess the following statements about the benefits of BPMS and select the level of your agreement, from strongly disagree (1) to strongly agree (6). (If you answer this question, you don't need to answer question 14.)

	1	2	3	4	5	6
1. BPMS helps your organization to inspect internal and external environment in time	○	○	○	○	○	○
2. BPMS assists automated workflow management	○	○	○	○	○	○
3. BPMS simulates the business process to identify process weak points and resource bottlenecks so as to provide the best alternative efficiently	○	○	○	○	○	○
4. BPMS integrates and streamlines business processes	○	○	○	○	○	○
5. BPMS ensures that each employee can acquire and deal with up-to-date information	○	○	○	○	○	○
6. BPMS provides a stage for managers with insight into the business processes to obey compliance requirements	○	○	○	○	○	○
7. BPMS can cope with business process change so that it makes your organization more flexible	○	○	○	○	○	○
8. BPMS guarantees quality of information and reduces redundant and inconsistent data	○	○	○	○	○	○
9. BPMS assists your customer services to obtain higher customer satisfaction	○	○	○	○	○	○
10. BPMS reduces your management costs	○	○	○	○	○	○

Other (please specify)

14. If you haven't deployed BPMS, please indicate why you don't use it. (Multiple Answers)

☐ I have never heard of BPMS before

☐ A BPMS requires employees to have high level of knowledge and technological skills

☐ A BPMS costs too much

☐ It takes too much time to train employees to use it

Other (please specify)

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Factors Affecting Business Process Management System Adoption and Diffusion

15. If you are interested in our research, please write down your e-mail address. We will provide our report and outcomes of the investigation.

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