Analyzing IT maintenance outsourcing decision from a knowledge management perspective

Mehmet N. Aydin · Mark E. Bakker

Abstract IT outsourcing is a complex and opaque decision problem. Managers facing a decision about IT outsourcing have difficulty in framing what needs to be thought about further in their discourses. Framing is one of the most crucial steps of human decision making and needs to be assisted to better understand a decision situation. In this research, we examine a number of decision primitives in the context of an IT outsourcing decision situation. We demonstrate how the decision primitives can be employed so that managers can probe deep to better understand a decision situation and to establish a decision basis. In the organizational setting, we exemplify the use of the decision primitives in relation to the perceived outsourcing implications for the managers looking for assistance in accommodating a knowledge management perspective on IT outsourcing. Consequently, we induce insight and a guideline on how to use knowledge management for effective outsourcing in one of the leading financial institutes in Europe.

Keywords Decision analysis · IT outsourcing · Knowledge management

1 Introduction

Today's business activities depend heavily on supporting information technology (IT), so its maintenance is a critical process and needs to be performed with the highest possible quality. IT maintenance requires organization-specific and technical knowledge to achieve desired IT quality. IT outsourcing can be a daunting task for managers who are uncertain about its various implications for, for instance, business performance, required IT support, and knowledge management. Given the complexities inherit in an outsourcing decision (Nam et al. 1996), we consider it as an opaque decision problem; meaning that it is lucid, hard to understand or explicate and cannot be solved simply with common sense and an intuitive appraisal. In other words, managers facing a decision about IT outsourcing can have difficulties to frame what needs to be thought about further in their discourses. One of the difficulties with an opaque decision problem is an appropriate framing. For instance, in the context of IT maintenance outsourcing, as part of a framing exercise, managers from the business side—i.e., an IT user organization—can prompt various questions such as: What are the effects of losing people and their knowledge on IT maintenance and business performance? How can knowledge management be used to cope with undesired effects?

If framing is not done properly, one can face errors of the third kind, which is working on wrong problems (Howard 1988). Appropriate framing of an outsourcing decision problem can help managers in surfacing the underpinnings of the decision basis and related values, objectives, alternatives, and judgments. It is acknowledged in the decision science (Keeney 1982) that this is one of the most difficult steps in decision analysis and needs to be assisted for high-stake and opaque decisions. This research is concerned with a number of decision primitives that can aid managers in framing an IT outsourcing decision problem. We demonstrate how managers employ the decision primitives to probe deep to better understand a decision situation. With an illustrative case, we exemplify the use of the decision primitives in relation to the

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perceived outsourcing implications for managers looking for assistance in accommodating a knowledge management perspective on especially IT maintenance outsourcing.

Having introduced the research motivation, in the next section we present a relevant research context. After that, we introduce a number of decision primitives for framing an outsourcing decision. Section 4 includes an explication of the use of the primitives for an illustrative case. In Section 5, we discuss the details of these primitives by adopting a knowledge management perspective as a preferred orientation. This in turn leads to a guideline on how to use knowledge management for effective outsourcing in one of the leading financial institutes in Europe.

2 Relevant context: IT maintenance, outsourcing and knowledge management

Outsourcing is not a recent management fad, although a lot of organizations have started IT outsourcing projects in the last two decades (Swanson and Ramiller 2004). Outsourcing with different forms such as offshoring has already been present for about two centuries. The relocation of the textile industry from England to the USA in 1821 was probably the first offshoring practice. In the information systems literature, outsourcing has been studied along with its social, economical, managerial implications for the involved parties (DiRomualdo and Gurbaxani 1998; Klepper 1995; Lacity and Hirschheim 1993; Osei-Bryson and Ojelanki 2006). Although several IS scholars mention the importance of knowledge management in outsourcing, little research is done about how organizations deal with managing knowledge in outsourcing situations.

Knowledge management is a concept that continues to create controversial perceptions in organizations. For some practitioners, it may be perceived as a fuzzy management concept and for others, knowledge is the single most important resource for organizations today and managing knowledge like any other resource is therefore critical to business performance (Davenport and Prusak 1998). On the other hand, KM is thought to be useful in preventing a knowledge drain that may occur when a company is downsizing and/or outsourcing business activities. In this research, our approach is that knowledge management is not a fad, but necessary in order to exploit a company's knowledge resources. The argument that KM is a viable concept, albeit under certain constraints, is a premise of this research.

While analyzing knowledge use in the illustrative case, we consider three kinds of knowledge, as discussed in (Nonaka and Takeuchi 1995; Al-Hawamdeh 2002):

– Explicit knowledge, which is essentially information and already articulated and captured,

– Implicit knowledge, or "know-how", which can be captured and codified as information, but has not been articulated yet, and

– Tacit knowledge, which is not and cannot be captured and codified as information, but is important for how information is interpreted.

IT maintenance often requires organization-specific knowledge about internal business operations to be supported and specific technical knowledge to achieve desired IT quality. To manage IT Service Support and Maintenance several approaches and methods are proposed. One of them is the IT Infrastructure Library (ITIL), which is based on best practices and considered as de facto standard for IT service management (OCG 2000).

For the purpose of explicating decision primitives in the illustrative case, we shall discuss IT maintenance together with ITIL. One of the primary components of IT service management is the Service Desk (SD), which is the interface between the end-user of IT services and the support processes. When a disturbance in an IT service occurs, the Service Desk is notified, and Incident Management (IM) is started. The SD remains in contact with the notifier of an Incident, from when an Incident was first reported until it is solved or closed (see Table 1 for the differences between call, incident and problem management). At the case organization, the Service Desk, called IT Helpdesk, includes Business Helpdesks and Functional Management departments. If the incident can be resolved easily, the SD will handle it. If the incident needs more attention, the IM process is started.

In some cases these incidents may be relatively harmless, such as a printer that is not printing. At the case organization, which is a financial institute, however there are systems that are very critical to business operations. A disturbance in the Internet banking system for example needs to be resolved very quickly in order to ensure that transactions reach the financial markets in time. Incident management is therefore one of the most important processes of service support. When there is a need for further investigation to identify the underlying cause of one or several Incidents, Problem Management is started. The Incidents are analyzed and a temporary work-around is created to deal with the Problem while a structural solution is designed. During this period, the Problem is a Known Error. When a structural solution is ready to be implemented a Request for Change is submitted to Change Management, which is the process responsible for implementing the solution. Information concerning the change is recorded through Configuration and Release Management.

The above process, including roles, responsibilities, governance, and intra- and inter-organizational relations, kinds of incidents, kinds of knowledge needing to solve

Table 1 The differences between call, incident and problem management

	Call management	Incident management	Problem management
Description	The process that handles all notifications, registrations and solution	The process that restores normal operations of IT services	The process that eliminates or prevents structural errors in the IT infrastructure
Scope	All notifications, both call and events	Incidents that could not be resolved by Call Management	All threats that endanger the stability of ICT services
Inputs	Calls and events, from users and monitoring functions	Incidents received by the ICT Helpdesk that could not be resolved easily	Incidents that may have an unknown underlying problems, events, management observations, known error list from suppliers or projects
Outputs	Feedback to user and if possible a solution. Closure of Incidents	Solution to users (through IT help desk), input to PM	Solution to users (through IT helpdesk), unresolved problems

problems, has often organization-specific characteristics and can vary considerably from one organization to another. Therefore, the outsourcing decision needs a special care to understand an organization-specific situation of the maintenance process. It is this care that motivates managers to know how to go about framing an IT maintenance outsourcing decision.

3 Framing an IT maintenance outsourcing decision

3.1 Basic primitives for framing a decision problem

Decisions are made in all steps in life that varying with different degrees of their visibility. The notion of decision and decision framing is intimately linked to agency (the one (s) involved in making a decision), several actions and cognitive activities, the matter and relevant information on which a decision is made, and its boundary in terms of time and other contextual features (Aydin 2006).

A decision-making process involves a structure and phases at which certain cognitive activities are performed irrespective of the matter at hand. The idea of 'structuring' a decision process is articulated along with the phase theorem of problem solving in the decision-making literature. Lipshitz and Bar-Ilan (1996) review several models, including (Simon 1965), and confirm the importance of early phases of a decision-making process. They state "...effective problem-solving is contingent on proper execution of early phases, variously labelled problem solving, problem framing, problem structuring or problem formulation (p. 57)."

Seeing that decision aid for early phases of decision-making is critical, it is important to know what basic decision activities are performed during these phases. A five level problem representation model of Humpreys (1992) provides further details. The model contains five qualitatively different levels of constraint setting, each associated with a different kind of discourse concerning how to structure the constraint at each level. These levels are: (1) making best assessment, (2) exploring "what-if" questions, (3) developing the structure of the problem within a frame, (4) use of "problem expressing discourse" and, (5) exploring "what needs to be thought about" within a "small world". Humphreys (1992) argues that in practice decision support focus is often level 1 and 3, which is concerned with the normative or prescriptive paradigm. His critiques are concerned with the fact that many models of decision support systems (DSS) adopt normative or simply prescriptive views of decision situations and simply fail to accommodate the 'reality' of certain decision processes which involve high-stakes, countervailing arguments, conflicting interests, time pressure, and uncertainty. That is, due to incurrence between the 'realities' of the support provider and the one to be supported, these models are doomed in achieving their premises. Implications of this incongruence are evident in many failure stories about tools and computerized decision support systems that are not used effectively in practice.

Another important contribution to an understanding of early phases of decision making comes from those studies focusing on decision analysis (DA). DA is a formulization of common sense for decision problems which are too complex for informal use of common sense (Keeney 1996). Technically, it is based upon a set of logical axioms and can be used to analyze the complexities inherent in decision problems. Similar to psychotherapy, DA is aimed to surface the thinking, feelings and values that decision agents wish to use on the problem. By clarifying the process, these thoughts and feelings can be opened for review by others. Various techniques are proposed to perform DA at the individual and group level. For instance, Eden (2004) adopts "personal construct theory" of Kelly (1955) and use cognitive mapping as a technique to represent chains of action-oriented argumentation inherit in decision situation. Notice that the very idea of decision analysis is not to solve the decision problem, but to aid decision agents in transforming an opaque decision situation into a transparent

decision basis. During this transformation, in most cases, alternatives seems first to be generated, then a value structure is developed to evaluate alternatives, as opposed to reverse (Corner and Corner 1995). In this research, our interest is not on the representation of decision under-pinnings, but a way to assist a decision agent in eliciting and framing these underpinnings. In fact, the focus of this research is the very first step of this process.

Table 2 shows basic primitives and contextualized decision elements for IT maintenance outsourcing. The first two primitives, "identification of roles, agents who perform specific roles, and a presented problem as a subject matter" and "an orientation of the decision matter and the subject matter concerns", are proposed to initiate framing of the decision situation. These are fundamentals of any decision and considered as taken for granted. In this regard, one can focus on one or all of the generic roles involved in a decision situation (Vahidov and Elrod 1999). Nevertheless, in this research, we focus on particular decision roles (proponents and opponents of the decision situation) whose decision frames are important for decision makers. For the illustrative case, as a decision matter, IT maintenance outsourcing is examined along with one preferred orientation, which is the knowledge management perspective. The last four primitives are induced from the axioms underlying early stages of decision analysis, which are known as "structure the decision problem" and "assess the possible impact of each alternative" (Keeney 1982).

The third primitive deals with contextualizing the decision matters; it is this primitive that helps determining boundary of decision matters and reveal a rich-context of related decision problems. How to deal with knowledge drain in outsourcing is an example of such problems. The fourth primitive refers to exploring alternatives concerning how to solve the problems under consideration. In the illustrative case, we mention several alternatives in terms of management measures, the kinds of knowledge to be

focused and the mechanisms for effective knowledge management. The next primitive is aimed to reveal expected consequences for each alternative. The effect of the proposed alternative refers to what would happen, whereas the effectiveness aspect indicates what would be achieved in terms of its objectives. Thanks to the last primitive, which helps to reveal the arguments (judgment and desirability) underpinning and logical linkages among other primitives.

We should note that these primitives are suggested as a means to facilitate human thinking to better understand a decision situation. Every decision is situation-specific and needs to be analyzed within its contextual peculiarities. This is the subject of the next section.

3.2 Preparation of contextualizing the decision primitives for IT maintenance outsourcing

We shall begin with the organization context, background of the decision and other relevant information that can help the reader to understand the decision situation examined in the organization.

Let us recall the importance of IT maintenance in an organization where, for instance, downtime of crucial information systems could have severe effects on business processes. This is especially true for financial institutes where IT services are vital to perform operations. This illustrative case was conducted at one of the leading financial institutes in Europe. In 2005, the organization approached the university to help them analyze service delivery managers' (SDMs) concerns and related decision matters about the IT maintenance outsourcing decision. A SDM, as one of the key roles in IT maintenance, is responsible for the service provided to the business by the IT department. This role needs to understand required IT support from both the IT and business side. In each domain of the organization, it was known that such a role had

Table 2 Framing IT maintenance outsourcing from a knowledge management perspective

Basic primitives for framing	Contextualized elements for the frame of the IT maintenance outsourcing decision
P1. Identification of roles, decision agents and a "presented" problem as a subject matter	What is this decision about? Whose concern is this? Decision agents (Executives Managers); Proponents, Opponents, and Proposers (Managers, Vendors, External Agent); IT maintenance outsourcing
P2. An orientation of the decision matter and the subject matter concerns	What is important in the decision? Knowledge management as a preferred perspective; various management concerns (knowledge loss, inadequate IT support, poor business performance)
P3. Exploration of related decision problems	Understanding of the rich-context of maintenance practice (past, present and future analysis); dealing with knowledge drain
P4. Exploration of alternatives	Management measures; knowledge management systems (see Table 3)
P5. Exploration of consequences	Effect and effectiveness of maintenance outsourcing; possible ways and contributions of KM to avoid IT Quality Drops
P6. Elicitation of judgment and desirability	Perceived expectations, value-laden statements (reasons for any interest in the decision); Why is it a concern and alternative, consequence?

several management concerns about the outsourcing decisions. The point was that even though executives made this outsourcing decision, uncertainties about the scope of outsourcing raised managerial concerns and fears that the decision to outsource and the outsourcing itself would cause valuable and vital knowledge to disappear. This would cause the level of IT service maintenance to drop, which in turn will influence the business processes negatively. The concerns were:

1. There will not be sufficient knowledge left to keep performing IT maintenance at a high enough level.
2. There will not be sufficient knowledge left to be able to assess the business implications of a disturbance in the IT function.
3. The first two concerns are not shared by senior managers, or at least it appears there is no strategy to deal with the impending knowledge loss.

For the executive agenda, two strategic intents—efficient IT maintenance (leading to cost saving), IT maintenance effectiveness (contributing to business performance)—(DiRomualdo and Gurbaxani 1998; Goo et al. 2000) were of interest to the senior managers.

Notice that the management rationale was primarily concerned with analysis of management perceptions on the *perceived* effects of outsourcing and the effects of knowledge management and loss of critical knowledge (see Fig. 1). Managers wanted to know to what extent that the strategic intents are aligned with management perceptions about the decision and its implications for the business operations and knowledge issues. Furthermore, by adopting the knowledge management perspective as a preferred orientation, they need to explore what related decision problems are out there and to identify their alternatives and consequences.

4 Explication of the decision primitives in an organization

4.1 Background knowledge about the decision in the organization

The organization where the outsourcing decision was made is a large international financial institute having offices in over sixty countries, employing over 100,000 full time people. In an effort to streamline their world-wide IT activities they decided to globally outsource and offshore parts of their IT functions. The decision to outsource has had several effects. The most obvious effect has been the organizational change resulting from a new business model related to outsourcing. Another effect that has already been taking place has been that employees seeking job security are leaving the company. We call these factual effects because they can be observed and we know them to be true. A third, speculative effect follows from these facts. That is, in light of the diminishing workforce and the new business model, concerns are being raised by the IT department and the business about the quality of IT service maintenance in the near and far future. In this regard, there are two points to mention. First, it is of interest to the business that the IT-systems that support their business operations are up and running and stay that way. In this case, the stakes are especially high, since operations at the organization and at the domain in particular are highly dependant on IT. Any disturbance in the availability of IT maintenance could have disastrous effects. Second, at the organization the maintenance of the IT systems is done by the IT department and the business itself. Both have distinct responsibilities, but a certain overlap exists and often both 'sides' work together to resolve problems. Thus the business also has knowledge about IT maintenance.

Fig. 1 Visualizing management rationale in the IT outsourcing decision situation
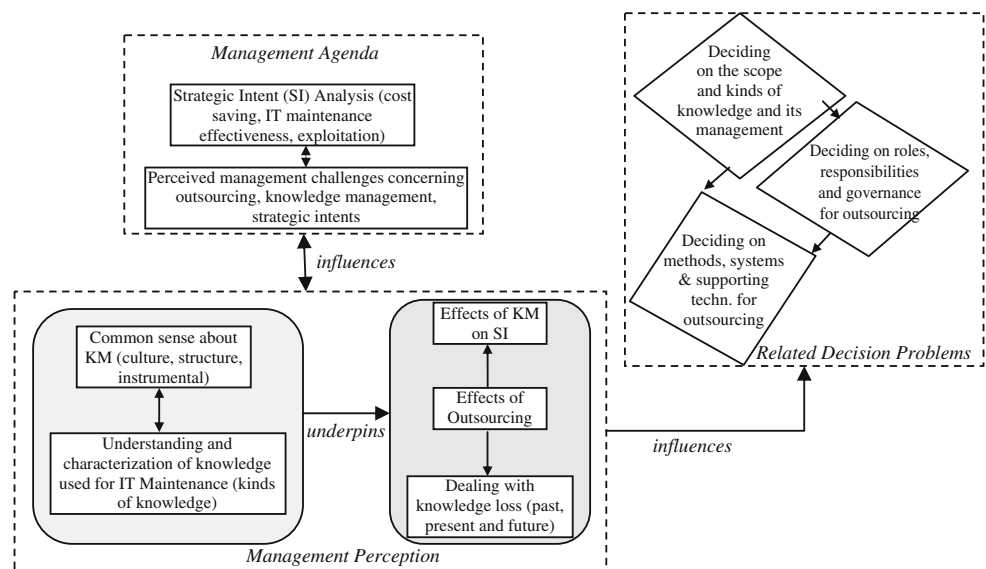
The organization distinguishes two main IT activities, development and maintenance of IT systems, both of which were subject to outsourcing. For the illustrative case, we focused on the functional and technical IT maintenance in the investments domain of the organization. We only examined the knowledge aspect in relation to IT maintenance and all other aspects such as costs or hardware are beyond the scope of framing (Smith et al. 1996).

4.2 Explication of primitives

4.2.1 Identifying relevant roles, decision agents

In the organization setting, relevant agents were mainly managers who have been responsible for their business operations and managers who are accountable to provide adequate IT support and maintenance. Notice that the method of analyzing the primitives is interview, which is a frequently used method in decision analysis (Keeney 1982). We have identified 12 managers from different departments and conducted 1 to 2h interviews with them. Given the strategic impact of the decision, we were careful that people might give strategic answers when truthful answers are socially unacceptable or damaging to the interviewee. In particular, people often feel they might lose their job or minimally some status or power by giving away too much of their knowledge. However, we have not tried to elicit sensitive knowledge; instead we aimed to identify the kind of knowledge that is used for an operational purpose. The agents interviewed do not include the knowledge workers themselves, but their direct superiors. The choice to interview representatives of the IT side is clear, since they had knowledge about the systems and their maintenance. They were the people able to relate the

strategic intents to the management agenda. This enabled us to employ the primitive concerning "elicitation of judgment and desirability".

4.2.2 Relating primitives to interview questions

The interview starts with open-ended questions, such as "What comes to your mind concerning the outsourcing decision?" The answer to this question gives the interviewer an idea of how the interviewee stands vis-à-vis the subject and it might also help to identify existing common sense on the subject matter. Furthermore, it gives an indication of how familiar the interviewee is with the subject, so the interviewer can assess whether he needs to elaborate on certain concepts or issues. Next, a couple of questions induced from the primitives were asked. Notice that the questions are contextualized within managers' discourses, meaning that knowledge issues are expected and managers need to know if knowledge management could be useful, which is related to "exploration of alternatives". Figure 2 depicts the instantiation of the primitives in terms of key notions and their relations as they are reflected in the interview questions.

As we proceed in presenting the interview results, these notions and corresponding primitives would be clearer. But, for the moment, we give some examples. The question concerning the perceived advantages of knowledge management to improve business operations is clearly drawn upon the primitive "exploration of consequences". Attention is both on current problems that might be addressed and on additional benefits that might arise when knowledge management is applied. Another set of questions is concerned with the actual knowledge that is needed for maintenance and knowledge that is otherwise important to the organization. The purpose of these questions is to

Fig. 2 Key notions and related decision primitives in the framing of the IT outsourcing decision
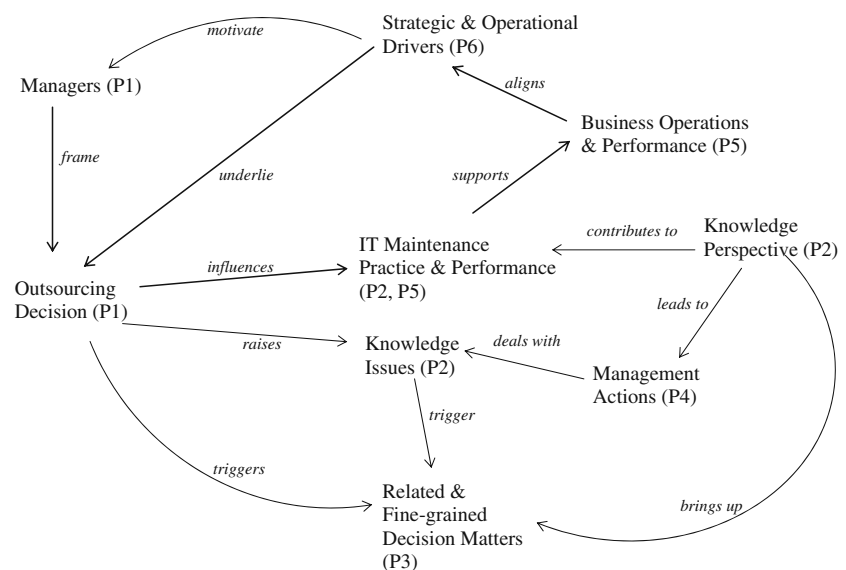
determine specific knowledge areas, which are useful when maintaining the systems of the business domain, and to find out whether the interviewee thinks there is certain knowledge that gives the organization a competitive advantage, which should be treated as confidential. Then there is a question about who takes responsibility of knowledge management, which is related to "exploration of related decision problems". Here are the questions induced from "exploration of alternatives": Should this be the responsibility of the IT department? Should it be the responsibility of the business or should it perhaps be a shared responsibility? Perhaps it is even felt that after outsourcing the vendors are completely responsible. The final couple of questions are related to "exploration of alternatives" and "elicitation of judgment and desirability". In particular, the questions are about what actions in relation to knowledge management might be taken in solving expected problems, what particular supporting systems can be appropriate.

4.2.3 Perceived effects of outsourcing on IT quality

In light of the reorganization, a distinction has been made between a start-up period, which has been set arbitrarily at 1 year, and the period after 1year, after which things should have settled down. Most concern is obviously with the first year, although many people have thought there are benefits right from the start. All interviewees have been concerned about the uncertainty that comes with a new situation. More specifically, people are unsure of how day-to-day activities, for which they used to simply pick up the phone, will be done in the future. They also fear that in the beginning the knowledge level of the vendor will be insufficient to timely and correctly deal with incidents. A negative aspect that was mentioned not only for the short term is that a vendor will feel less commitment towards the business.

"Employees of an external party would be less involved with the business"

"First maintenance will be slower than the business would like. Later it will also not be very fast, but the process will be more professional, there will be less incidents and solutions will be more structural"

"Documentation will be more complete which means that maintenance will be easier"

On the positive side, all people believe that in the long run the situation will improve and be better than the current situation, not in the least because a vendor simply can not afford to make mistakes. The general common sense is that as a result of outsourcing, in the long run the maintenance practice would be improved, documentation will be much more complete and solutions will have a more structural nature.

4.2.4 Perceived effects of IT quality drops on business performance

Since this question has much to do with the, mostly short term, effects of outsourcing, not much new has come up. Mentioned again is the lack of knowledge after outsourcing, caused by insufficient transfer of knowledge or failing to commit the right people to the organization for along enough period after outsourcing. One thing that was new was that the vendor was thought to have not enough knowledge of the business of the organization to be able to provide a good enough service.

"Insufficient knowledge of the business"

"Before outsourcing: lack of personnel, lack of motivation with remaining personnel"

"It is unknown how the different groups will work together"

One person also mentioned that not only the first year after the reorganization has been complete, but also before the reorganization will start, problems may occur because of a lack of personnel and motivation.

4.2.5 Dealing with knowledge drain due to outsourcing

Most of the interviewees agreed on one thing: when certain people leave the company, a knowledge gap will occur. On how to deal with this, or actually, how was dealt with this in the past, people were less in accordance with each other. A couple of interviewees mentioned making sure there was not only one person with critical knowledge or experience by using job rotation or traineeships. For a task that required two people, another solution that was mentioned was to match people together with supplementing skill sets or to match a more experienced person with a less experienced one. Finally, one interviewee mentioned the Sarbanes–Oxley law as having caused an internal review of key areas to identify key persons.

"We delay work when the absence is temporary"

"We started a project to deal with the future retirement of one particular person"

"For night duty, we paired to people whose skills complemented each other. This way they have more combined knowledge and they can learn from each other"

"There used to be problems with key people. As a result of the Sarbanes–Oxley regulations there are procedures to identify key people in key areas. We try to train people on time or eventually ask people to stay on longer"

When these key persons are identified, measures can be taken to avoid a sudden loss of knowledge or experience. On the other hand, one interviewee has given explicit examples of projects that needed to be delayed or rescheduled to match with the availability of specific people and he even mentioned a separate project, created especially to reduce a single individual's commitment.

4.2.6 Common sense and understandings of knowledge management in the organization

It is interesting to see that the interviewees that answered this question often put emphasis on culture, discipline or procedures or instrument (see the quotes below). These are all 'soft' issues when compared to computer-based tools and other IT solutions. During the rest of the interview however, when the subject came up, most people suggested requirements for computerized systems for knowledge management, but had very little ideas on how to deal with the culture, discipline or procedures which they initially indicated were most important.

"KM supports those with less or no experience to help them create a basis for developing their own knowledge"

"KM is about providing and ensuring easy access to practical knowledge"

"KM is a means to the end of solving problems adequately"

"KM is a large chunk of discipline combined with a nifty tool"

"KM is largely a cultural issue"

This is probably due to the fact that most of the managers interviewed have an IT background, work on a daily basis with IT and also use different knowledge or information management systems of which they can say what could be improved (consistency, ease of use, searchability, etc). Thus, although there is this discrepancy between the start and the rest of the interview, it should be noted that there is a belief that KM is more than merely another tool, and depends heavily on culture, discipline and procedure.

4.2.7 Possible contributions of KM to avoid IT quality loss and lower business performance

Based on the belief that knowledge management can provide people with a basis for development of their own knowledge and experience on a certain subject, KM may help to diminish the negative effects of a lack of experienced people.

"We need to think about how we can avoid that the vendor does not have enough knowledge after the transition"

"KM can help giving people unfamiliar with the subject a basis on which they can expand their knowledge themselves"

Thinking about preserving knowledge after the reorganization is also important. KM provides tools to identify important areas and to capture essential knowledge.

"Coping with a person leaving or being absent becomes easier"

"For new employees, the informal network and 'how things are done here' is unknown"

"Better predict the impact of incidents and changes by having a 'map' of all systems and their underlying relations"

"Reducing the amount of incidents and solving incidents faster because of increased learning"

The issues mentioned in the quotes above are acknowledged as both problems before and after the reorganization. Emphasis is of course on issues that are currently being faced, since the future is largely unknown. The problems essentially all come down to one basic problem, which is that people do not have access to sufficient knowledge. This is caused amongst others by:

– Knowledge is scattered over different locations and difficult to disclose
– There are various databases with relevant knowledge.
– Some knowledge is only held by one person. When this person is unavailable, his knowledge is unavailable.
– The original system documentation is incomplete.
– Documentation on changes and additions and the 'why' of those changes and additions is incomplete.
– An overview of all systems, their components and their relations is lacking, as well as an easy way to relate IT components to specific business activities.

It should be noted that answers to this question usually started with "It would be nice when..", indicating that the following are not major problems, but nice extra's that are expected when knowledge management is introduced. One interviewee interestingly enough expressed the hope that search results would be smaller. It turned out that the amount of information and the way it was provided were overwhelming. So, it was difficult to distill the relevant information. The hope was stated that with the introduction of knowledge management the provided information would be more accurate. Overall it is believed that KM will make

the process of IT maintenance more effective and more efficient. Furthermore, several main areas were mentioned as being important to maintain high levels of maintenance:

– Knowledge of the systems, additions, alterations and cross-relations. Especially knowledge about how different parts of the systems work together is regarded as crucial. This is knowledge on paper as well as in people's minds. Many have expressed concerns about the completeness of documentation and the ability to improve this. One interviewee expressed his concerns explicitly about the online systems. One person indicated that it was not important to retain this knowledge for maintenance purposes, but it was important for test-purposes. Tacit knowledge often used for scarce incidents (once every 6 years) is difficult to transfer.
– Knowledge of the business processes. This is especially important for writing system requirements and for translating technical disturbances to business impact.
– After the reorganization knowledge is being created and used outside the organization, which poses new kinds of challenges concerning the management of that knowledge, especially when many different vendors are used.

5 Illuminating the decision primitives: Exploration of related decision problems and alternatives

As shown in the previous section, management problems are frequently cited in the interviews together with undesired consequences of IT outsourcing from a knowledge management perspective and possible actions to overcome them. Table 3 summarizes most frequently mentioned problems, consequences and actions. In this section, we shall further discuss these matters.

5.1 Management actions and related decision matters

When asking people about which knowledge they thought would be lost after the reorganization, the most common answer was: "the organization specific knowledge." This includes knowledge about the organization, its products, the structure, the people and the IT systems. The most obvious

Table 3 Frequently mentioned managements problems, consequences and actions

Perceived management problems	Expected consequences	Possible actions
Leave or scarcity of experienced in-house people	Loss of critical skills, knowledge or developing the wrong skills	1. Identify knowledge that is critical → identify key knowledge holders → capture their knowledge/ transfer their knowledge/retain them 2. Transfer key members (temporarily) to the vendor 3. Use a central repository and a unified process model for collecting all relevant knowledge
Loss of control over the vendor	Lack of commitment on the vendor side leading to poor IT maintenance Too much dependence on one vendor. In the case of a multi- vendor setup: communication between all parties	1. Create explicit SLAs including incentives and penalties 2. Agree with vendor to store the knowledge they acquire during the contract in such a way that is easily transferable 3. Make sure that the retained governance organization is owner of all knowledge and communications 4. If there is no expertise to run a governance organization as described in point 3, this expertise should be acquired
Lack of executive commitment and shared understandings on the importance of KM for outsourcing	The negative effects of uncertainty on the use of social influence	1. Important that knowledge holders do not feel threatened in their job security 2. Show senior management that investing in KM is less costly than dealing with problems that result from bad preparation for outsourcing
Uncertainty about the scope and kinds of knowledge to be outsourced and how business performance to be affected	Emerging fuzziness on existing process, governance model	1. By categorizing the knowledge it should be easy to identify which kind of knowledge can be outsourced more easily than another
	Lack of (socio-technical) readiness for outsourcing transition	2. Take credit not only on a more formal process, but also the high quality of work in outsourcing vendor

is again certain pieces of knowledge about the IT systems. Each piece of knowledge that has been created only in the minds of people, i.e. tacit knowledge, is in danger of becoming lost to the organization. Examples that have been mentioned are design choices, solutions to previous problems, relations amongst systems and between systems and business, where to find which information. Not only identifiable knowledge is in danger of becoming lost, but also a certain 'feel' for the IT systems at the organization. This 'feeling' can help steer people in certain directions when searching solutions to a problem. Something else that is mentioned is the uncertainty of the future situation. Not only on personal level, but also concerning how things will be in the future. Before the outsourcing execution, everybody knows where to turn and who to ask in a certain situation. Because the new organizational structure is largely unknown there are many uncertainties about how the business processes will look like and be supported.

During the interviews it became clear that there are three different time frames that can be discerned when discussing related decision matters. The first is the time between announcing the reorganization and the moment it comes into effect, the second period starts when the reorganization begins, and the third is when everybody is used to the change. We will start with discussing the last period and work back to the current situation.

The overall consensus is that the reorganization will improve the quality of IT maintenance. The more structural nature of the solutions is specifically mentioned. Most interviewees have seen the reorganization as a step towards another level of maturity. It is also expected that the new structure forces all parties involved to work on a more professional level. This includes clear agreements, for instance via Service Level Agreements (SLA), of what is expected from each party, better and more complete documentation, more transparency and better management and control. On the other hand, the initial startup period is reason for some concern, mainly due to the expected lack of the organization specific knowledge with the vendors. This knowledge gap means that in some cases the wheel needs to be reinvented, causing delays in solving incidents. Furthermore, it will also take some time before everybody knows who does what and everybody 'finds each other'. The expectation is that during this period in which all parties need to learn how to work together it will take even longer to solve incidents. This period, on top of the physical separation of business and IT also weakens communications concerning the relation between incidents and the effects they have on business.

Another point of concern is that currently the distinction between business and IT is not as clear as it probably should be regarding certain roles and tasks. This means that some tasks that are currently carried out by people from the IT department should formally be performed by the business. The expectation is that the external vendors will not perform tasks that formally should not be performed by an IT-party. This means that these tasks will need to be performed by the business itself. However, the business does not currently have the expertise to perform these tasks, which will have minimally a slowing effect on IT maintenance processes. Also during the period leading up to the reorganization, the concerns about the quality of IT maintenance have been expected. This has to do with the availability of personnel and their motivation. When the announcement about the change was made, people naturally became uncertain about their future. As a consequence, they have started looking for other opportunities and people have been leaving the organization seeking job security. In general it can be said that the best people have the best chances on the job market and thus are inclined to leave first. This means that for the long run their knowledge is lost and can no longer be captured, and for the short run the quality of IT maintenance may drop. The performance of the people who remain with the organization may be negatively influenced by two things. Firstly, the may have become less motivated to perform their jobs as well as they can. Also, since the staff has been thinned out, the work load on those remaining behind increases.

5.2 The kinds of knowledge needed for desired IT maintenance

It is confirmed that the knowledge that has been used for the IT maintenance processes needs to be reused. The vendor most likely would like to capitalize on the large part of the proven knowledge. But, after outsourcing, the new situation also involves managing and controlling the new organizational structure which requires additional knowledge.

Regarding the knowledge required for performing IT maintenance most interviewees agree that minimally a complete documentation of the systems is needed. The organization uses a repository to store all documentation related to systems. Opinions vary on how complete it is, but everyone agrees that when it is complete, the largest part of the knowledge requirement is met. Where the repository documents may be lacking, it is possible to complete them. Another part is knowledge about the underlying relations between systems and between systems and business. This knowledge is hard to find, if available at all. When available it is often not documented but located in the minds of people, gathered through experiences over the years.

Another previously mentioned and important piece of knowledge is knowledge about the organization specific business operations. This knowledge is needed to carry out the IT maintenance processes as smoothly as possible and to relate the impact of disturbances in the IT service to the

effects for the business of the organization. Related to this is the knowledge needed to manage and control all parties involved in the IT maintenance processes. In the new organizational structure, the so-called Retained IT Organization will be responsible for providing the business with the IT they need. Although it is still largely unknown how this department will fill in its role, it seems it will play a central role in the web of different parties involved. It will need to have knowledge on both the business and IT since it will act as an intermediate between those two. While it does not need detailed knowledge about the systems, e.g. such as described in documentation, it will need to know, or at the least allow relevant external vendors to know how the business depends on IT. Since the domain depends heavily on IT and uptime is critical, each disturbance may cause serious problems. Therefore it is necessary to be able to assess the impact an incident has on the business, so appropriate measures can be taken. The retained organization also needs to know about the business in their communications towards the external IT vendor.

6 Practical insight on planning knowledge management in IT outsourcing

Notice that knowledge management in this outsourcing situation is not considered as a stand alone practice, but it should be integrated into the other functions, including Human Resources Management (HRM), to deal with expected problems. The Fig. 3 illustrates how managers can analyze and make decisions and take actions in resolving the problems. It is important to mention that the proposed flowchart in Fig. 3 is for planning and should not be considered as a fixed guideline. Indeed, several ad-hoc measures need to be taken and possible some actions would be adjusted according to the decision situation at hand.

Three basic steps are identified in this regard: (a) together with the vendor(s), determine the responsibilities of each party, particularly those that are knowledge-related, (b) assess the difference between the needed knowledge (tacit, implicit and explicit) and the current knowledge, further referred to as 'the knowledge gap', and (c) determine if and how to bridge the knowledge gap.

Step 1: Determine responsibilities and knowledge requirements

Outsourcing parts of the organizational activities require each party to know what their own responsibilities and those of the other parties involved are. The transfer of knowledge and communication in general is more difficult than in the old situation (before outsourcing) because the location and maybe even the time of the parties involved in the knowledge exchange and communications are not the same. Also, one should be aware possible cultural differences that might hamper communications. Nevertheless, the reorganization forces the organization to take the following steps:

1. Formalize process and describe steps (this should be straightforward if they adopt a particular method, e.g. ITIL)
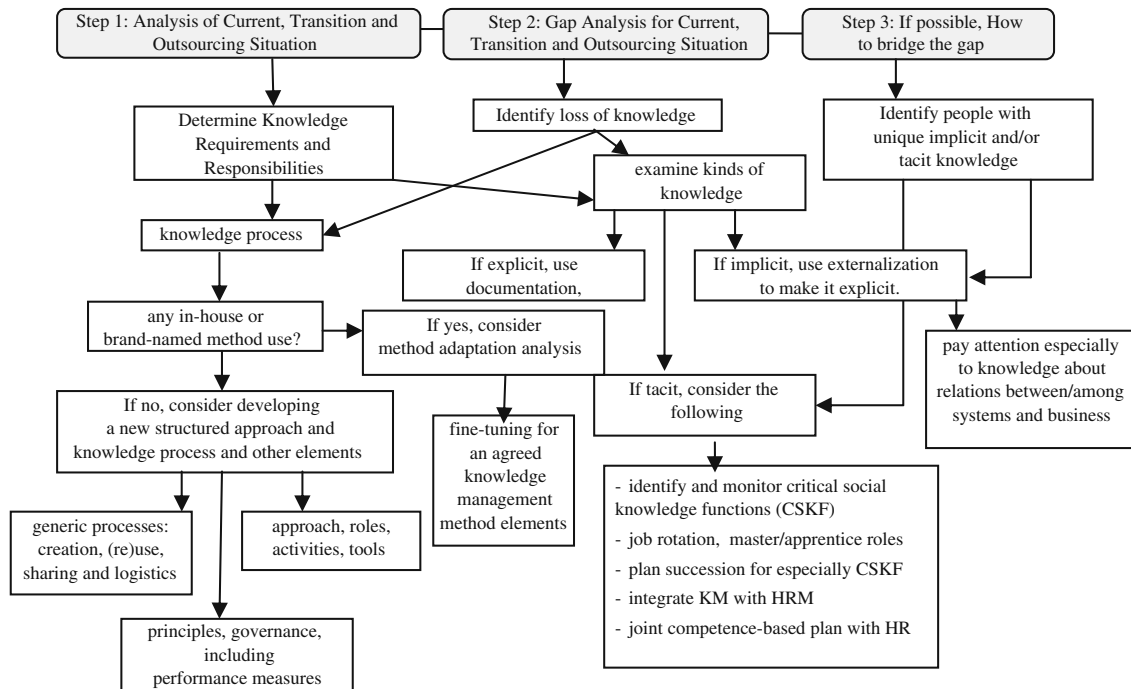

Fig. 3 Illustration of how to analyze, make decisions and take actions in resolving the problems

2. Agree who does which step.
3. Formalize input and output of each step, especially important for the transition points.
4. Agree on communication/transfer methods.
5. Based on the step 3, determine requirements each party needs.
6. Agree who is responsible for giving a party the needed knowledge to perform steps (especially the knowledge needed to perform IT maintenance).

Step 2: Assess the knowledge gap between current and required knowledge levels

One of the causes of the gap expected is knowledge drain. In particular, managers should be aware of the causes of such gap, which includes:

– When owners of implicit knowledge leave the organization before their knowledge is externalized.
– Certain kinds of knowledge (e.g., tacit and ad-hoc built knowledge) by nature can not be captured.

Knowledge gaps that can be diminished by externalization are: (a) documentation (where it is incomplete); (b) knowledge about relations amongst systems and between systems and business; (c) knowledge to perform business responsibilities in IT maintenance process.

Knowledge gaps that can be diminished by acquiring new knowledge are:

– Knowledge to perform business responsibilities in IT maintenance process
– Critical (social) Knowledge Areas/Functions (C(S) KFs) that are/will remain responsibility of the organization

Discern knowledge needed by the vendor that will perform IT maintenance, the retained IT organization and the business.

Step 3: Determine if and how the knowledge gap can be bridged

– Identify people with unique tacit knowledge and retain their services for the organization (internally or externally) or get them to transfer their knowledge to someone who will remain available to the organization.
– Identify gaps in explicit knowledge that can be filled by externalization of implicit knowledge possessed by employees. Capture this knowledge by, for instance, individual interview sessions and group sessions.
– Identify additional gaps in knowledge that is needed for the retained IT organization (mapping of IT systems and their link with business) and the business (depending on divide that is agreed upon)

7 Concluding comments

The goal of this research is to examine a number of decision primitives in the context of an IT outsourcing decision situation. We contend that an IT outsourcing decision is an opaque decision problem and needs a careful analysis. Thus, those managers wishing to make a sense of this decision situation need assistance in framing what needs to be thought about further in their decision situation. We provide a number of decision primitives that can assist managers in framing their thinking about IT maintenance outsourcing in an organizational setting.

One of the contributions of this study is to contextualize these primitives in the context of IT outsourcing. In doing so, we consider knowledge management as a preferred perspective on the decision situation. Noticeably, this contextualization along with the KM perspective brings up unprecedented decision matters and alternatives and underlying judgment and desirability. We illustrate this contextualization in a large financial institute where it is decided to outsource parts of their IT activities, including the technical and functional maintenance of IT systems.

By employing the decision primitives, we have been able to surface the underpinnings of the managers' perceptions on the decision. For instance, the primitives of "exploration of related decision problems" and "exploration of consequences" help to identify perceived management problems that there will not be sufficient knowledge left to keep performing IT maintenance and not be able to assess the business implications of a disturbance in the IT function. As for the primitive "exploration of alternatives", we focus on the three kinds of knowledge (explicit, implicit, and tacit) needed to perform IT maintenance activities. By employing the primitive "exploration of consequences", we highlight possible actions in resolving management problems. In doing so, we identify which knowledge is in danger of becoming permanently lost by outsourcing. Tacit and implicit knowledge can leave the organization when their knowledge holder does. Most required knowledge can be documented and thus made explicit, and it is easier to share, especially over time and distance. It is important to try and do this when this implicit knowledge is still available to be captured. However, we discuss that there still are many situations that need to be solved by experienced people whose knowledge is possibly tacit knowledge. It is important to try to keep these experienced people available to help with these exceptional cases and in the meantime transfer their knowledge to colleagues through socialization. People need to be stimulated to share their implicit and tacit knowledge. We propose several actions in relation to effective use of knowledge management and suggest creating awareness

about the perceived problems and their consequences before deciding on the scope of IT outsourcing.

Two remarks are worth noticing. First, the primitives employed can be extended further to a more complex decision analysis model. This might be needed to reach a transparent decision basis for representing and quantifying the decision matters, alternatives, consequence, and desirability. This could be a promising research subject for investigating later stages of decision making, such as evaluation of alternatives, choice and action. Second, we contextualize and exemplify the primitives in the IT maintenance outsourcing in an organization, which is large international financial institute where there is a complex and historically rich IT maintenance practice to be outsourced. Surely, contextualizing the primitives in different organization may bring additional insight in framing the decision and this will be a potential research topic. But, the primitives employed in this study might remain effective. The illustrative case in this research shows how useful the primitives can be for managers to probe deep to better understand a decision situation including alternatives, consequences and desirability for successful IT maintenance outsourcing.

References

Al-Hawamdeh, S. (2002). Knowledge management: Re-thinking information management and facing the challenge of managing tacit knowledge. *Information Research*, 8(1), October, Retrieved from http://InformationR.net/ir/8-1/paper143.html.

Aydin, M. N. (2006) Decision-making and support for method adaptation, Dissertation, University of Twente, Enschede, The Netherlands, ISBN 90-365-2375-3.

Corner, J. L., & Corner, P. D. (1995). Characteristics of decision in decision analysis practice. *The Journal of the Operational Research Society*, 46(3), 304–314.

Davenport, T. H., & Prusak, L. (1998). *Working knowledge*. Boston, MA: Harvard Business School Press.

DiRomualdo, A., & Gurbaxani, V. (1998). Strategic intent for IT outsourcing. *Sloan Management Review*, 39(4), 67–80 Summer.

Eden, C. (2004). Analyzing cognitive maps to help structure issues or problems. *European Journal of Operational Research*, 159(3), 673–686.

Goo, J. Kishore, R, & Rao, H. R. (2000). A content-analytic longitudinal study of the drivers for information technology and systems outsourcing. *Proceedings of the 21st ICIS*, Brisbane, Australia, pp. 601–611.

Howard, R. A. (1988). Decision analysis: Practice and promise. *Management Science*, 34(6), 679–695.

Humphreys, P. C. (1992) Discourses underpinning decision support. In Berkeley et al. (Eds.), Context sensitive decision support, *IFIP Conference Proceedings* 111, Chapman & Hall, ISBN 0-412-83740-2.

Keeney, R. L. (1982). Decision analysis: An overview. *Operation Research*, 30(5), 803–838 Sep.–Oct.

Keeney, R. L. (1996). Value-focused thinking: Identifying decision opportunities and creating alternatives. *European Journal of Operational Research*, 92, 537–549.

Kelly, G. A. (1955). *The psychology of personal constructs*. New York: Norton.

Klepper, R. (1995). The management of partnering development in I/S outsourcing. *Journal of Information Technology*, 10, 249–258.

Lacity, M. C., & Hirschheim, R. (1993). *Information systems outsourcing: Myths, metaphors and realities*. New York, NY: Wiley.

Lipshitz, R., & Bar-Ilan, O. (1996). How problems are solved: Reconsidering the phase theorem. *Organizational Behavior and Human Decision Making*, 65(1), 48–60.

Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company*. Oxford, UK: University Press.

Nam, K., Rajagopalan, S., Rao, H. R., & Chaudhury, A. (1996). A two-level investigation of information systems outsourcing. *Communications of the ACM*, 39(7), 36–44 July.

OCG (2000). *Service support*. London: The Stationary Office.

Osei-Bryson, K.-M., & Ojelanki, K. N. (2006). Managing risks in information systems outsourcing: An approach to analyzing outsourcing risks and structuring incentive contracts. *European Journal of Operational Research*, 174(1), 245–264.

Simon, H. A. (1965). *The new science of management decisions*. NY: Harper & Row.

Smith, M. A., Mitra, S., & Narasimhan, S. (1996). Offshore outsourcing of software development and maintenance. *Information & Management*, 31, 165–175.

Swanson, E. B., & Ramiller, N. C. (2004). Innovating mindfully with information technology. *MIS Quarterly*, 28(4), 553–583.

Vahidov, R., & Elrod, R. (1999). Incorporating critique and argumentation in DSS. *Decision Support System*, 6, 249–258.

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