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A Method to Select IT Service Management Processes for Improvement

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Abstract:

Although process improvement is crucial for organizations that seek quality in their operations, there is a lack of explicit guidance on how to select the critical processes to improve. We propose a structured method to guide the selection of processes for improvement in IT service management (ITSM) and designed and evaluated a decision support system (DSS) for process selection. We designed the process selection method to be theoretically grounded, have balanced business and ITSM objectives, and be supported by a DSS. We took a design science research approach to develop, demonstrate, and evaluate the process selection method and DSS. We applied task-technology fit to inform the design and explain the DSS's development and utility. We used the balanced scorecard and SERVQUAL models to structure business objectives and service gap perceptions. We conducted ex ante evaluation during the development process and interviews for an ex post qualitative evaluation. The results suggest the method is effective, valid, and useful and that it offers benefits in terms of perceived decision quality and decision efficiency. The DSS's utility was confirmed because it enabled evidence-based decision support for the process selection method. Using the proposed method, practitioners can follow a workflow for selecting critical IT service processes that need to be improved based on current business objectives and confirmed by key process stakeholders. The proposed method and the DSS prototype could form a basis for future research in defining the scope for process improvement projects in other fields.

Keywords: Process Selection Decision, Decision Support Systems, IT Service Management, Task-Technology Fit, Design Science Research, Balanced Scorecard, SERVQUAL, ITIL.

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INTRODUCTION

It is a well-known principle that managing scope is one of the most important functions in any project (Khan, 2006). Process improvement projects are no exception. Without a concentrated focus on critical processes, an organization's energies, resources, and time will be wasted. Therefore, most companies choose to address a discrete set of processes to focus their limited resources on the most critical processes (Davenport, 1993). We conducted this research because of the dearth of academic research and practical guidance in the area of scoping process improvement projects.

The international standard for process assessment, ISO/IEC 15504 (ISO/IEC, 2004), defines four key process improvement scoping dimensions: (2) organization context for improvement, (3) organization unit to be improved, (3) highest capability level to improve, and (4) processes to improve. The first three dimensions depend largely on the specific organizational settings. To address the fourth dimension, we developed a general method to select processes for improvement. To help achieve this objective, we designed and evaluated a decision support system (DSS) for process selection in the IT service management (ITSM) field. We chose the ITSM field to demonstrate the process because (1) ITSM has a strong focus on ongoing process improvement as part of continual service improvement (Lloyd, 2011), and (2) the processes that ITSM frameworks define provide a platform to test process selection for improvement. We used a design science research (DSR) approach (Hevner et al., 2004) to explicate the requirements and theoretical principles for the new process selection method for IT service processes.

To operate in a highly competitive business environment, organizations require the support of continually improving IT services. Even though ITSM's primary objective is to support business operations (Galup, Dattero, Quan, & Conger, 2009), the value of IT services for better business-IT alignment has been reinforced at a strategic level (Luftman, 2000). The widely used ITSM framework Information Technology Infrastructure Library (ITIL®) provides guidance on process-oriented continual service improvement (Lloyd, 2011). Process improvement is also a requirement of the service management system in the international standard for ITSM: ISO/IEC 20000 (ISO/IEC, 2011). One of the quality management principles is the process approach (ISO, 2012) that reinforces the value of process improvement in management systems for quality. However, process improvement initiatives are hindered by the lack of empirically validated guidelines for a consistent method in selecting processes to improve.

Academic research and industry adoption in the area of ITSM process improvement have concentrated on using maturity models to determine capability levels; for example, the capability maturity model integration (CMMI) appraisal method for process improvement (CMMI, 2011). Another widely used framework is the international standard for process assessment ISO/IEC 15504 (ISO/IEC, 2004). Various process improvement guidelines have been proposed based on this standard (Mesquida, Mas, Amengual, & Calvo-Manzano, 2012). A widely adopted ITSM process assessment framework based on academic research that combines ITIL and ISO/IEC 15504 is Tudor's IT process assessment (TIPA) (Barafort, Di Renzo, & Merlan, 2009). TIPA suggests that carefully selecting processes is crucial to determine the scope of ITSM process improvement. However, the existing process improvement frameworks focus on assessing and improving processes. The selection of processes for improvement has received limited attention. Organizations

CONTRIBUTION

The evaluation of the process selection method in this paper indicates that it meets our requirements of being theoretically grounded, balanced, and competently supported by a decision support system (DSS). This paper makes several contributions to theory and has important implications for practice. Our process selection method can be viewed as a functional design principle. It extends prior guidelines by providing a fine-grained approach to select critical IT service processes for improvement. In addition, it clarifies the importance of using two key decision factors: business objectives and service gap perceptions based on the balanced scorecard and SERVQUAL models respectively.

We discuss guidelines to take kernel theories, the balanced scorecard, and the SERVQUAL frameworks and use them to produce a theoretically grounded artefact. This is a useful design principle. This paper offers future scholars a detailed explanation of research methods, prior theories, expository examples, and case study evaluations as an example of how to confront the challenges of presenting design work for a novel method.

For practitioners, the process selection method can be used as an evidence-based tool to support decisions on selecting important processes to improve. The method has good descriptive and prescriptive utility by providing outputs that are readily actionable.

seldom have the budget, time, resources or requirements to improve all processes in a single process improvement project. Little research on a consistent method for selecting the appropriate processes to improve exists. This decision is crucial to the success of any improvement project (Davenport, 1993).

A major purpose of ITSM is to provide effective IT services that support business objectives. The concept of balanced scorecard originally developed by Kaplan and Norton (1992) can be used to link IT service processes with business objectives. We use the balanced scorecard in our research design for this purpose. Likewise, academic research on IT service quality has focused on analyzing the gap between customer expectations and perceived service delivery using the SERVQUAL model (Parasuraman, Berry, & Zeithaml, 1993; Parasuraman, Zeithaml, & Berry, 1985). The SERVQUAL model has been used extensively to study IT service quality (e.g., Carlsson, 2006; Jiang, Klein, & Carr, 2002; Kettinger & Lee, 2005; Pitt, Watson, & Kavan, 1995; Watson, Pitt, & Kavan, 1998). We use this model in our research design to canvas the views of key process stakeholders to ascertain their service gap perceptions. Our proposed method to select critical IT service processes incorporates business drivers from the balanced scorecard framework and service gap perceptions from the SERVQUAL model.

To structure this paper, we follow the DSR publication schema that Gregor and Hevner (2013) propose. In Section 3, we examine prior approaches of process selection in the literature. In Section 4, we describe the DSR methodology we used that's based on Peffers, Tuunanen, Rothenberger, and Chatterjee (2008) and how we integrate our research method with theoretical input from the task-technology fit (TTF) theory (Zigurs & Buckland, 1998). We also outline the steps of the process selection method and demonstrate how we applied it to develop a DSS. In Section 5, we report our case study's findings, which we used to guide the process selection activity during a major IT service process improvement project. In Section 6, we conclude the paper and discuss this study's implications for future research and practice.

LITERATURE REVIEW

We reviewed academic and IT industry literature for existing process selection methods for process improvement. Initially, we used the findings of two recent extensive systematic literature reviews to determine existing ITSM process improvement initiatives and how they addressed the process selection activity: one on IT service quality measurement frameworks (Lepmets, Cater-Steel, Gacenga, & Ras, 2012) and another more specifically on ITSM process improvement based on ISO/IEC 15504 (Mesquida et al., 2012).

We found eight existing approaches for ITSM process improvement activities with some references to process selection. Barafort et al. (2009) propose ITSM process assessment supporting ITIL using Tudor's IT process assessment (TIPA). They briefly specify process selection criteria and factors for choosing processes; however, they detail no structured method for selecting processes. Earlier research on TIPA suggests conducting pre-assessments with the aid of Porter and Millar's (1985) value chain diagram to identify the critical core processes that support business objectives (Barafort et al., 2002). However, the research on TIPA focuses on process assessment and does not explain why and how a process selection method was applied before assessing IT service processes.

Likewise, the standard CMMI appraisal method for process improvement (SCAMPI) framework extensively discusses a method to determine scope in terms of the organization and its associated sampling factors (CMMI, 2011). However, it does not provide guidance for selecting process areas for appraisal. Similarly, ITIL has defined a process maturity framework to assess the capability of IT service processes (Hunnebeck, 2011) but fails to mention how processes are selected for improvement. Other IT service process improvement frameworks such as IT service CMM (Clerc & Niessink, 2004), SPICE1-2-1 for ISO20000 (Nehfort, 2007) and TickITPlus scheme (BSI, 2010) have defined process areas and acknowledge that the processes need to be grouped and prioritized for improvement, but none put forward any guidelines for selecting processes.

The existing studies support the notion that process selection is a crucial step in process improvement, and several of them also suggest factors that associate processes with business goals. The process selection method must contribute to the two initial steps of the seven-step continual service improvement (CSI) approach defined in ITIL: (1) identify the strategy for improvement, and (2) define what will be measured (Lloyd, 2011). The business drivers for ITSM process improvement address the link between process improvement and business objectives. This contributes to the first step of the CSI approach in defining the strategy for improvement. The second step of CSI is to seek stakeholder opinion on which processes they think actually need to improve. While most of the existing studies link business objectives to processes in order to justify process selection, none of the above studies explicitly incorporate service gap perceptions of key stakeholders to understand process improvement priorities. Since ITSM has a strong customer-oriented focus, it is risky to ignore how service beneficiaries and other process stakeholders priorities processes that need improvement. Therefore, a more comprehensive method for selecting IT service processes should consider service gap perceptions along with business drivers for process improvement.

In searching for a more explicit method for process selection, we extended our literature review beyond ITSM process improvement initiatives to find general guidelines for selecting critical processes in other domains and found several prominent process selection methods proposed in the literature.

Huxley (2003) developed a ten-step business process improvement methodology that application service providers can apply to select critical processes to improve. Their proposed methodology uses a ranking of five factors: impact, failure probability, dependency, success probability, and cost/benefit to prioritize processes to improve.

The US-Navy (1996) developed a handbook for basic process improvement that includes a process selection worksheet with some practical advice on selecting processes to improve. The handbook incorporates several important considerations such as understanding customer needs, linking processes to major problem areas, and adopting a minimalistic approach (start with processes requiring little improvement efforts).

Hammer and Champy (2009) suggest organizations should select processes that are dysfunctional and have a high customer impact. Likewise, Davenport and Short (1990) define two factors that process stakeholders should consider when selecting processes for redesign: urgency and business impact. Zellner, Leist, and Johannsen (2010) suggest that critical processes should be compared with an organization's core competencies, customer characteristics, and critical success factors in order to prioritize the processes with the help of the quality function deployment method (Akao, 2004). They demonstrated their method in a case study of a Six Sigma project at a bank. Likewise, Meade and Rogers (2001) provide a general process selection methodology that considers process performance against businesses' vision to select critical processes.

The existing studies propose several guidelines for selecting processes. However, decisions regarding which processes to choose for improvement have generally been complex with little structure in the decision making process (Meade & Rogers, 2001). The majority of the methods for selecting processes that we discuss above consider improving process attributes or factors that associate processes with business goals. Indeed, multiple criteria for selecting processes have been proposed. However, none existing study report developing or using a DSS that enables multi-criteria decision making to facilitate a structured method in selecting processes to improve.

Davenport (1993) suggests that, even with defined factors for process selection, "results are often ambiguous, and differential weighting of the factors must be applied". In situations that require making a selection, using some kind of measurement and thus choosing the process with high scores is a viable option. There is an opportunity to leverage a DSS where each of the IT service processes can be prioritized by considering the two key factors we propose (business drivers and service gap perceptions). Then we can present the outcome of the DSS with a process weighting score to make it easier for management to choose IT service processes to improve. As such, we explore a novel method to select IT service processes facilitated by a DSS. Such DSS also enables practitioners to make decisions more accurately and efficiently regarding selecting processes based on relevant information.

To summarize, based on the literature review, we find a need a structured process selection method that is:

a) **Theoretically grounded:** the process selection method must be justified using conventional theoretical arguments. We use task-technology fit (TTF) theory (Zigurs et al., 1998) to develop a fit profile that addresses how a decision task (which processes to improve?) and relevant technology dimensions of the DSS are matched in articulating the process selection method. We detail the application of TTF in developing the process selection method in Section 3. We also adopt two theoretically sound frameworks that are widely used in business: the balanced scorecard (Kaplan & Norton, 1992) and the SERVQUAL model (Parasuraman et al., 1985).

b) **Balanced:** the process selection method must associate ITSM processes with business objectives and priorities as perceived by process stakeholders (Lloyd, 2011). Therefore, it is necessary to have a balanced approach in selecting processes, which is based on two factors: business drivers and service gap perception. Our literature review shows that previous studies have largely focused on business drivers at the expense of service gap perception. However, the process selection method we detail here incorporates both factors in balance.

c) **Supported by a DSS:** we can see that the several proposed methods for selecting processes above reveal well-defined activity steps for doing so**.** Technology dimensions (viz., communication support, process structuring, and information processing) (Zigurs et al., 1998) can be effectively used to develop a DSS to support process selection decision tasks. A DSS can support multi-criteria decision making scenarios (Peng, Zhang, Tang, & Li, 2011).

None of the prior studies in or beyond the ITSM field meet all of these requirements; instead, they have focused on activities for improving core processes. In the remainder of the paper, we examine the premise that using a balanced process selection method facilitated by a DSS strengthens the quality and efficiency of the decisions made to effectively scope process improvement projects.

METHODOLOGY

With this research, we followed a design science approach (Hevner, March, Park, & Ram, 2004) to develop a new artefact. The DSR approach focuses on clarifying a research artefact's goals in the form of a construct, method, model, or instantiation (March & Smith, 1995) and on building and carefully evaluating artefacts' utility (Hevner et al., 2004; Venable, 2006). In this paper, we use artefact to mean a method for selecting IT service processes to improve. To operationalize the design and evaluation of the method, we constructed a DSS and evaluated it at a case organization.

Following Peffers et al. (2008), the DSR approach involves a research process model with six steps:

1. Identify the research problem (lack of a fine-grained process selection method);
2. Define objectives of a solution (DSS technology dimensions);
3. Development of an artefact (a process selection method emerging from a fit between the process selection challenges and DSS technology dimensions);
4. Demonstration of the artefact (single case study with analysis of implementation of the DSS in a major ITSM process improvement project);
5. Evaluation of the artefact (qualitative semi-structured interviews with IT service managers to assess utility of the DSS); and finally,
6. Communication (presentation and discussion of the method and DSS for future research).

Task Technology Fit and Design Science Research

The original version of TTF theory held that IT is more likely to have a positive impact on individual performance and will be used if its capabilities match the tasks that the user must perform (Goodhue & Thompson, 1995). TTF deviates from self-reported user evaluations and looks at the "fit" between technology features and task requirements (Gebauer, Shaw, & Gribbins, 2010). While Goodhue and Thomspon (1995) developed TTF to examine the fit and its impact on individual performance, Zigurs et al. (1998) proposed a fit for effectiveness of group support systems and subsequently verified its application (Zigurs, Buckland, Connolly, & Wilson, 1999). Since then, the theory has been applied to a diverse range of information systems.

We operationalize TTF theory in terms of the research process mapped to the DSR process model (Peffers et al., 2008). We use TTF theory to justify the design, whereas we use Peffers et al.'s (2008) DSR methodology to justify the research process. The task is to select IT service processes that are relevant to the business and perceived as important by process stakeholders. This task can be defined based on the two primary dimensions of task complexity (Campbell, 1988): (1) presence of "outcome multiplicity" due to decisions regarding selecting a subset of processes based on business drivers and service gap perception factors, and (2) absence of "solution scheme multiplicity" due to the explicit specification of the problem and one proposed course of action to solve the problem. The task, therefore, can be categorized as a decision task (Zigurs et al., 1998).

Figure 1 demonstrates our research methodology mapped to DSR steps. We present it as a kernel theory to explain our research approach.

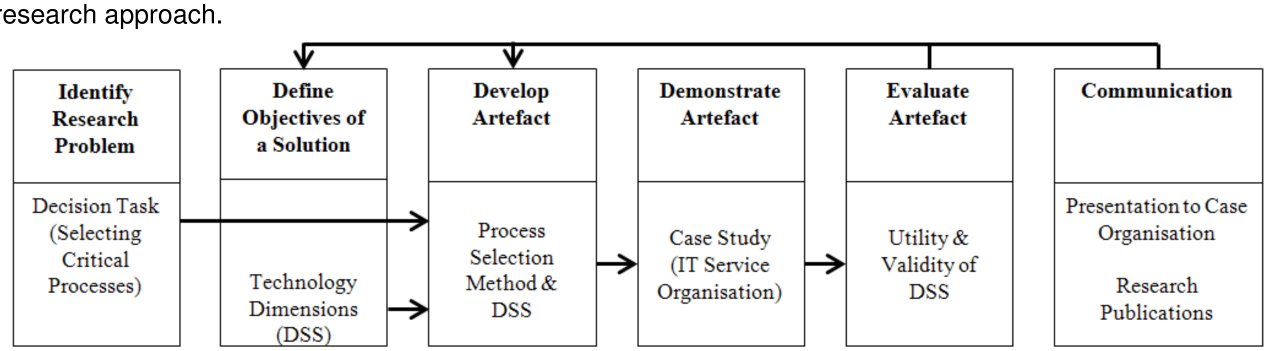

Figure. 1: Research Methodology Based on DSR Steps and TTF theory (Adapted from Zigurs et al., 1998; Peffers et al., 2008)

Likewise, the three technology dimensions for group support systems (communication support, process structuring, and information processing) that Zigurs et al. (1998) propose are applicable to the proposed DSS for the decision task. We approach DSS development using a configuration that focuses on three technology dimensions:

a) "Communication support" dimension: DSS supports communication across all process stakeholders to determine important business drivers and service gap perception factors.
b) "Process structuring" dimension: DSS facilitates a workflow of selecting business drivers, understanding service gap perception, and mapping business drivers and service gap perception to select critical processes.
c) "Information processing" dimension: DSS calculates process scores based on the two factors and uses multi-criteria decision making techniques such as the analytical hierarchy process (AHP) (see Saaty 1990) for process selection.

In our research, we justify how we design and implement the artefact using prior theory and case study evidence. Kernel theories are already established theories that are used in DSR projects to both inform and justify the steps of DSR (Gregor & Jones, 2007; Venable, 2006; Walls, Widmeyer, & El Sawy, 1992). We use TTF theory (Zigurs et al., 1998) to design the fit between the process selection method and technology dimensions of DSS. The three technology dimensions (communication support, process structuring, and information processing) are linked to our DSS's design. We use the TTF as a functional kernel theory to justify the design. Likewise, the justificatory knowledge for the research process shown in Figure 1 is another kernel theory. Similarly the balanced scorecard and the SERVQUAL frameworks serve as the other kernel theories. Ultimately, we represent the alignment between the decision task at hand and the technology dimensions of the DSS with an ideal fit profile that resulted in its design. Similarly, we conducted a single in-depth case study in an organization that is committed to ITSM process improvement to demonstrate the method and evaluate the DSS's utility.

Artefact Evaluation Protocol

To ensure the process selection method is grounded in both theory and empirical evidence, we evaluated it with case study evidence. (Eisenhardt, 1989). Our artefact evaluation protocol measures how effectively the artefact works in practice. We evaluated the DSS in situ using rich qualitative evidence to examine its utility and refine the method. We used evidence from a single organization to evaluate the DSS based on semi-structured interviews with key process stakeholders involved in a process improvement project.

We present two key rationales for relying on a single case for our current evaluation. Firstly, we present our case as a "revelatory case" (Yin, 2009) with which we were fortunate to have the opportunity to observe and analyze an ITSM process improvement project at the case organization. Such opportunities to investigate and intervene in an organizational process improvement project are difficult to organize. Secondly, we present a novel artefact based on a richly defined research problem. We recognize that the final evaluation that we present as a single-case study may not be as in-depth as those typically reported from behavioral research (Gregor & Hevner, 2013).

We implemented the DSS at the IT service department of a local government authority in Australia that had over 55 IT staff servicing over 150,000 residents. We interviewed four staff from the case organization including two senior IT service managers and two key service beneficiaries from top management. We required all participants to have worked in the case organization for a minimum of three years to ensure they had a broad perspective of the organization's processes.

We used semi-structured interviews to evaluate the DSS. The initial interviews with the process managers explored their experiences of using the DSS. After presenting the process selection matrix to the process managers, we conducted follow-up interviews to evaluate the outcome of the DSS. We used open-ended questions in both sets of interviews to probe perceived decision quality and perceived decision efficiency of the DSS. Perceived decision quality determines whether the decision outcome is valid and dependable, while perceived decision efficiency determines whether the decision process is easy to perform and is productive (Jarupathirun & Zahedi 2007).

During analysis, we attempted to verify the data of the first interview with the DSS outcome and probed contradictions using the second interviews in person or by email (Eisenhardt, 1989; Yin, 2009). Any contradictions led to a further search for a more refined process selection method and the resultant DSS. Triangulating the findings from the DSS with rich contextual data was especially important due to the novelty of the process selection method and its application as a DSS to this area of research (Jick, 1979; Sawyer, 2001). Another reason for two separate interviews over the course of the study was to assess the consistency of the responses and to make interviewees feel more comfortable with the researcher to disclose information (Walsham & Waema, 1994).

We gathered interview transcripts and DSS outcomes from the case over a one-month period and coded them using NVivo. We compared the responses to further refine the process selection method (Eisenhardt, 1989) and evaluate the content validity and internal consistency reliability of the outcome of the DSS (Straub, Boudreau, & Gefen, 2004). Since case study analysis relies on the interpretations of individual researchers, we mitigated the potential for bias by using rigorous data collection and analysis methodologies. Multiple researchers and case study participants reviewed the evidence and findings to check for inaccuracies or researcher bias. We presented intermediate research milestones such as preliminary models at several international research conferences and industry seminars to gather feedback. We reported several stages of the research work in academic and industry-related publication outlets. We also assured research objectivity by triangulating multiple data sources, comparing interview transcripts, and matching patterns between theories and data.

ARTEFACT DESIGN AND DEVELOPMENT

In this section, we describe each step of the process selection method, including our theoretical justification for the step. We present the development and demonstration the DSS at the case organization. We developed the method after several iterations of revisions and updates over a period of 18 months of intensive work in collaboration with five senior ITSM practitioners. Table 1 overviews the proposed method. The first step is to determine the initial list of IT service processes under consideration for improvement. This represents the input to the DSS. The second and third steps involve an exercise to select critical business drivers and identify process stakeholders' perceptions about service gaps simultaneously. The final step delivers the outcome by producing a process selection matrix that recommends critical processes for improvement.

Table 1: Process Selection Method for ITSM

Step	Factors	Step details
(1) Determine initial list of IT service processes	Input	Provide a list of all processes that are implemented in the organization with clearly defined purposes and expected outcomes.
(2) Select critical business drivers	Business value of processes	Select a key subset of business drivers across different sections of the balanced scorecard for the organization. Business drivers are linked to IT service processes with a score based on their alignment. This determines the rank of processes based on the organization's business objectives.
(3) Categories processes based on stakeholder service gap perception	Perceived importance of processes	Conduct a service gap perception survey of concerned process stakeholders based on the SERVQUAL model and present them with the survey findings to facilitate discussions about service gaps. Following these discussions, process stakeholders agree on categorizing IT service processes based on their need for improvement.
(4) Produce a process selection matrix	Outcome	According to process scores from steps two and three, present a process selection matrix to service managers to recommend which processes should be considered for improvement.

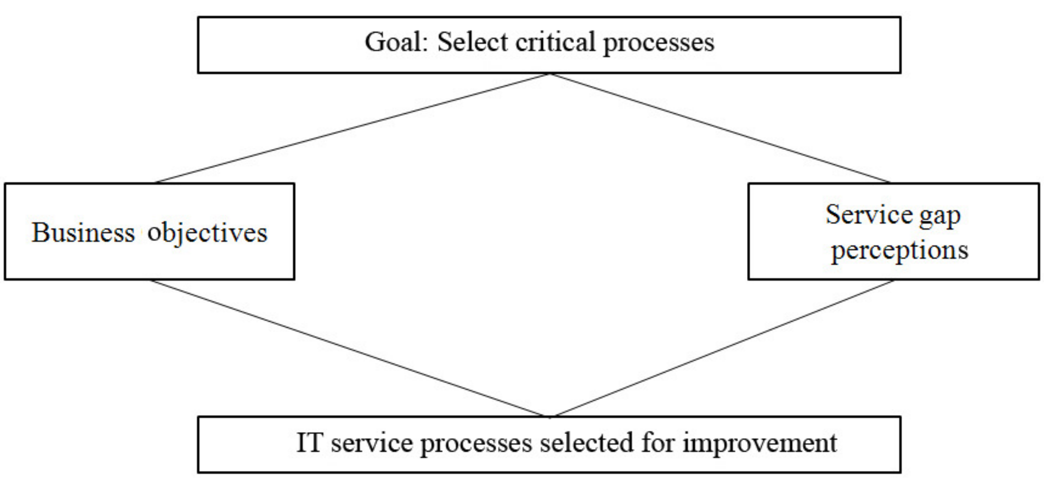

Figure 2: A Model to Select IT Service Processes for Improvement (Based on Saaty, 1990)

Based on the process selection method illustrated in Table1, Figure 2 follows the analytic hierarchy process analysis used to structure the method by decomposing the decision task into a hierarchy (Saaty, 1990). In the following section, we explain the steps involved in terms of describing the method, implementing the DSS, and demonstrating the to serve as a proof-of-concept for the artefact (Gregor et al., 2013; Peffers et al., 2008).

Determine Initial List of IT Service Processes

Method Description

The list of IT service processes that are considered for improvement provides input to the process selection method. All processes should be well established and implemented in an organization before being considered for ongoing improvement. Different IT organizations may have different processes under consideration for improvement. However, useful information for initial consideration of processes can be obtained from the process reference model based on the ISO/IEC 20000 standard (ISO/IEC, 2010) since this standard clearly specifies the purpose and expected outcomes of each process.

DSS Implementation

The DSS should present all relevant IT service processes for the process stakeholders to consider for improvement. For this project, we considered 12 IT service processes from ISO/IEC 20000. The selection criteria for the initial list of processes was twofold: availability of the process reference model from ISO/IEC 20000, and direct alignment between ISO/IEC 20000 and ITIL processes based on the ISO/IEC 20000-ITIL bridge published by Kempter and Kempter (2013). Table 2 overviews the initial ITSM processes along with their purpose specified in the ISO/IEC 20000 standard.

Table 2: Initial List of Processes for Consideration

#	Processes from ITSM International Standard (ISO/IEC 20000)	Purpose (specified in ISO/IEC 20000-4)
1	6.1 Service-level management (SLM)	Ensure that agreed service level targets for each customer are met
2	6.3 Service continuity and availability management (SCAM)	Ensure that agreed service levels will be met in foreseeable circumstances
3	6.4 Budgeting and accounting for IT services (BAS)	Budget and account for service provision
4	6.5 Capacity management (CaM)	Ensure that the service provider has service capacity to meet current and future agreed requirements
5	6.6 Information security management (ISM)	Manage information security at an agreed level of security within all service management activities
6	7.1 Business relationship management (BRM)	Identify and manage customer needs and expectations
7	7.2 Supplier management (SM)	Ensure supplier services are integrated into service delivery to meet the agreed requirements
8	8.1 Incident and service request management (ISRM)	Restore agreed service and fulfill service requests within agreed service levels
9	8.2 Problem management (PM)	Minimize service disruption
10	9.1 Configuration management (CoM)	Establish and maintain the integrity of all identified service components
11	9.2 Change management (ChM)	Ensure all changes are assessed, approved, implemented and reviewed in a controlled manner
12	9.3 Release and deployment management (RDM)	Deploy releases into the live environment in a controlled manner

Case Demonstration

We confirmed that the 12 IT service processes implemented in the case organization. Service managers at the case organization considered all 12 ITSM processes in the initial list of processes. They considered no other processes.

Select Critical Business Drivers

Method Description

After we determined the relevant IT service processes in step one, we determined the critical business drivers according to the balanced scorecard's dimensions (Kaplan & Norton, 1992). It is important to select critical business drivers rather than processes directly because most managers struggle to comprehend their business in terms of processes (Davenport & Short, 1990). While other frameworks such as value chain analysis, cost/benefit analysis, critical success factors, and risk assessments can also determine important processes that have the most crucial business impact, the balanced scorecard presents a more “balanced” analysis of key performance indicators for an organization on a strategic level from four key perspectives: financial, customer, internal business, and innovation and learning (Kaplan & Norton, 1992). Furthermore, the concept of balanced scorecard is well accepted in business as a core management tool (Kaplan & Norton, 2001). Business drivers derived from the balanced scorecard provide key performance indicators as valuable intellectual capital of an organization (Marr, Schiuma, & Neely, 2004).

The customer dimension of the balanced scorecard is split into internal and external customers to recognize that IT service providers deliver both internal- and external-facing services (TSO, 2011). This provides finer granularity in identifying the typical business drivers. We identified a list of 25 business drivers from the five dimensions of the balanced scorecard (see Figure 3). We reviewed two relevant balanced scorecard frameworks that were aligned to IT governance (Saull, 2000; Van Grembergen & De Haes, 2005) and one associated with enterprise resource planning (ERP) systems (Chand, Hachey, Hunton, Owhoso, & Vasudevan, 2005). Before deriving the 25 business drivers, we studied how prior researchers linked IT processes with business objectives. In consultation with an ITIL® expert practitioner with over 20 years of senior IT experience, we then reviewed the business drivers to contextualize them to the ITSM field.

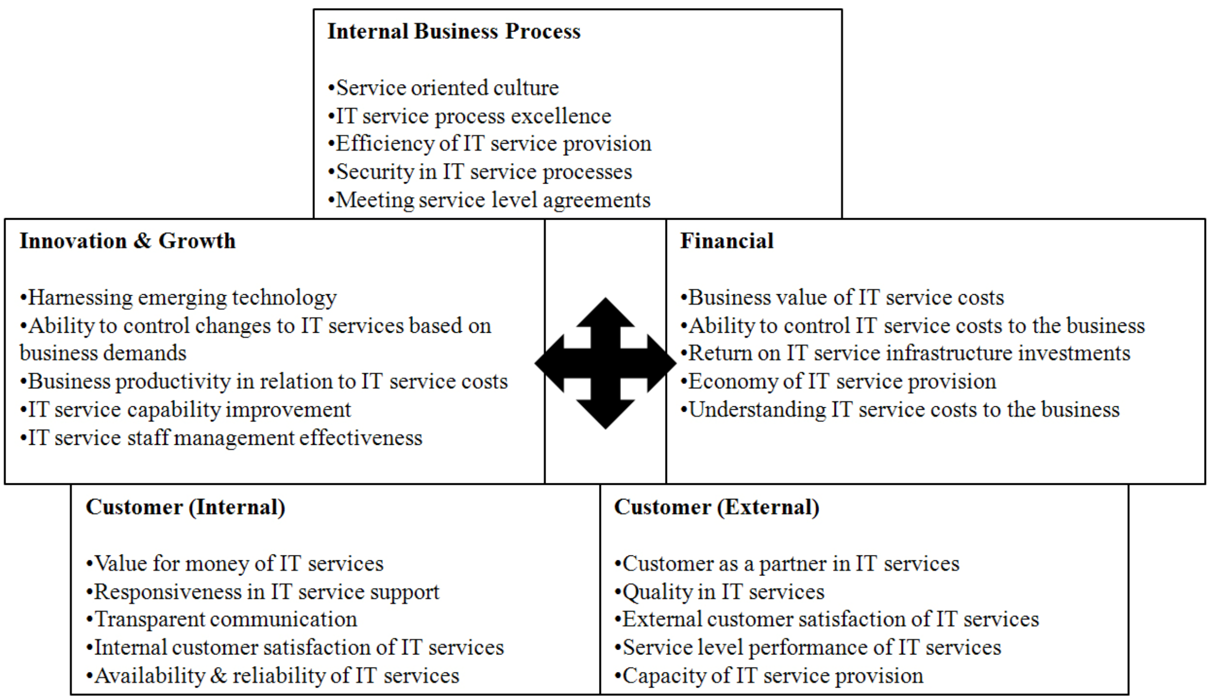

Figure 3: Business Drivers in the Context of IT Services Based on the Balanced Scorecard

Table 3: Rating Scale and Coding Instructions to Align IT Service Processes to Business Drivers

Alignment rating	Description	Coding instructions
4 (Fully)	Process is critical for the business driver	The overall purpose and ALL expected outcomes of a process can be clearly discerned with the business driver
3 (Largely)	Process is largely important for the business driver	The overall purpose and more than 50% of all expected outcomes of a process can be discerned with the business driver
2 (Partially)	Process is partially important for the business driver	The overall purpose and at least some (more than 15%) of the expected outcomes of a process align with the business driver
1 (Not)	Process is marginally or not important for the business driver	The overall purpose of a process does not align well with the business driver, and.at least one expected outcome of the process aligns with the business driver
0 (Not Applicable)	Process is not relevant for the business driver	There are no expected outcomes of a process that align in any way with the business driver

Using the ITSM concept that processes support the provision of services and these services in turn support the business objectives, we constructed a matrix that associates business drivers with IT service processes. This matrix links the impact of processes to business goals and, thus, provides a measure to determine which processes are more important.

The matrix relates each of the drivers to IT service processes by cross referencing the process purpose and expected outcomes (derived from the process reference model of ISO/IEC 20000 (ISO/IEC, 2010)) with each driver using an alignment score. To calculate the alignment rating, we used a five-point scale based on the process measurement framework defined in the international standard for process assessment ISO/IEC 15504 (ISO/IEC, 2004). Table 3 defines the ratings.

In order to develop the process-business driver alignment matrix, we developed a set of coding instructions to apply the alignment rating scale for each IT service process. After we agreed on the coding instructions, we presented them to five expert ITSM consultants with ITIL expert qualifications and over 15 years of senior IT management / IT consulting roles. We sourced the five experts from our networking activities at the ITSM practitioner conferences and seminars. The experts coded the alignment ratings using a Delphi technique in three rounds. A Delphi study is relevant in this context since it is a democratic and scientific method for developing and evaluating conceptual models (Moody, 2005). Table 3 shows the coding instructions the experts followed to assign alignment ratings to each ITSM process based on business drivers. Table 4 presents the final IT service process-business driver alignment matrix developed as an outcome of the Delphi study. Activities in an organization may be grouped into different processes and such choices may be subjective. Interfaces and interactions between different processes complicate alignment of processes with specific business drivers. However, we assume the explicit process list from the ISO/IEC 20000 standard in our research. An IT service organization that follows ITIL® or ISO/IEC 20000 guidelines in terms of process definition and implementation can use the following process alignment with business drivers as illustrated in Table 4.

1) Shortlist 10 most important business drivers from the 25 business drivers by ranking top two drivers from each of the five dimensions of the Balanced Scorecard;
2) Pairwise comparison to compare the 10 shortlisted business drivers against each other and arrive at the overall top four business drivers.

The rationale behind using the pairwise comparison is to apply adequate rigor in choosing the final four business drivers by comparing each of the shortlisted ten business drivers in pairs. Such a structured pairwise comparison technique can handle complex group decision making and is widely used in the scientific study of preferences based on the analytic hierarchy process (Saaty, 1990).

After selecting the top four business drivers based on consensus, the DSS calculates a score for each IT service process in the initial list by summing their alignment ratings (4—fully to 0—not applicable) based on the alignment matrix. We call this score the “business driver score” of the process. The maximum score that an IT service process can achieve is 16 (4—fully aligned with all four business drivers) and the minimum score is zero (not applicable to all four drivers). This score provides a metric to demonstrate the importance of IT service processes to business.

DSS Implementation

The DSS loads all 25 business drivers and provides an interface to rank the business drivers by key IT service process stakeholders in three groups; namely, customers (service beneficiary), IT service managers, and IT service employees. The driver ranking exercise comprises two steps:

Case Demonstration

We implemented the DSS in the case organization. In total, 12 process stakeholders participated in the driver ranking exercise and contributed to the process scores. Roles included four process managers, nine process employees, and three customers. There are more roles than participants since some of the participants undertook multiple roles in IT service delivery. The four business drivers selected were: (1*)* IT service process excellence, (2) meeting service level agreements from the internal business process dimension, (3) quality of IT services, and (4) external customer satisfaction of IT services from the external customer dimension.

Based on the alignment rating of each of the 12 IT service processes, the DSS calculated the business driver score for each IT service process as listed in Table A-1 in the appendix.

Table 4: ITSM Process—Business Driver Alignment Matrix												
Business driver \ process	**6.1 SLM**	**6.3 SCAM**	**6.4 BAS**	**6.5 CaM**	**6.6 ISM**	**7.1 BRM**	**7.2 SM**	**8.1 ISRM**	**8.2 PM**	**9.1 CoM**	**9.2 ChM**	**9.3 RDM**
Internal business process												
Service-oriented culture	3	3	3	4	3	3	3	4	3	3	3	4
IT service process excellence	1	3	2	3	1	3	2	3	4	3	3	4
Efficiency of IT service provision	2	3	4	2	1	2	2	1	1	1	2	1
Security in IT service processes	3	3	4	2	1	3	1	1	1	1	3	1
Meeting Service Level Agreements	4	4	1	3	1	3	2	3	3	1	3	3
Financial												
Business value of IT service costs	3	3	4	1	1	2	2	1	1	3	4	3
Ability to control IT service costs to the business	3	2	4	3	1	3	2	1	1	1	1	2
Return on IT service infrastructure investments	2	2	3	2	2	2	2	1	2	3	4	1
Economy of IT service provision	3	2	4	2	2	2	4	2	3	1	2	3
Understanding IT service costs to the business	3	2	4	3	2	3	3	2	2	3	3	1
Learning and growth												
Harnessing emerging technology	2	2	1	1	2	1	2	3	2	3	4	3
Ability to control changes to IT services based on business demands	4	1	1	2	1	3	1	4	1	1	3	3
Business productivity in relation to IT service costs	3	3	2	1	2	1	3	3	3	4	4	3
IT service capability improvement	4	3	2	4	1	3	2	4	1	1	3	4
IT service staff management effectiveness	2	1	1	2	1	1	1	3	1	1	4	2
Customer (internal)												
Value for money of IT services	3	3	3	1	2	3	1	1	1	1	3	1
Responsiveness in IT service support	2	1	2	1	2	2	3	3	3	3	4	3
Transparent communication	4	1	1	3	1	4	1	4	3	3	2	4
Internal customer satisfaction of IT services	4	3	2	3	2	4	2	4	3	1	3	3
Availability & reliability of IT services	3	3	3	1	2	3	1	2	1	1	3	3
Customer (external)												
Customer as a partner in IT services	4	4	1	3	4	4	2	1	1	1	1	1
Quality of IT services	3	3	1	2	3	3	1	3	3	1	2	3
External customer satisfaction of IT services	3	2	1	1	2	2	2	3	3	1	2	3
Service level performance of IT services	4	4	1	2	3	4	2	3	1	1	2	3
Capacity of IT service provision	3	3	1	1	2	2	3	1	1	1	3	2

Categorize Processes Based on Stakeholder Service Gap Perception

Method Description

In this step, perceptions of service gaps in IT service delivery across all process stakeholders are identified and presented to facilitate discussions to categorize processes based on their need for improvement. Even though the customer perspective of the balanced scorecard-produced business drivers to align IT service processes to business goals, the approach ignores key process stakeholders' perceptions of IT services. In order to query key stakeholders about their perceptions of quality service, we used a service gap perception survey based on the SERVQUAL model proposed by Parasuraman et al. (1985) to organize our understanding of service gap perception factors.

The concept of service quality and its subsequent models originated from the marketing field. Based on Grönroos (1990), there are three dimensions of service quality: technical quality, which refers to the outcome of the service; functional quality, which constitutes the process of the service provision; and corporate image, which builds on the technical and functional qualities. Since we examine the IT service processes, we are interested in the functional quality aspects that are proven to work well when measured using the SERVQUAL model (Kang & James, 2004). We used the SERVQUAL model to determine service gap perception factors that shape stakeholders' understanding of their role and preferences in executing IT service processes. Understanding service gaps can assist all key stakeholders to have a consistent and coherent view of their service perceptions regarding service processes that need improvement.

In the following sections, we present the rationale for the survey design to understand service gap perception. We analyzed the five service gaps regarding service quality perception proposed by Parasuraman et al. (1985) in their SERVQUAL model to determine service gap perception factors. Firstly, we analyzed the five service gap interfaces to determine service stakeholder involvement. Gaps 1 and 5 from the SERVQUAL model involved service customers and dealt with service expectation-perception gaps between and among customers and service providers. Similarly, Gaps 2 and 3 involved only internal service staff with deviations of the actual service delivery from service specifications. Likewise, Gap 4 dealt with communication issues between all service stakeholders during service delivery. Therefore, we grouped the five service gaps in three major areas based on service stakeholder interfaces: service expectation—perception gap, service specification—delivery gap, and service communication gap.

To address the three service gaps, we propose three solutions that IT services can offer to simultaneously address the service gaps: value proposition, degree of confidence, and better communication. We then expanded this to a total of nine specific service gap perception factors to focus on granular aspects in addressing the identified service gaps. Service value is defined by the utility and warranty of the service (TSO, 2011). Therefore, three service gap perception factors for value proposition included meeting expectations (warranty), budget effectiveness (utility), and important partner (utility and warranty). Likewise, to define service gap factors for degree of confidence, we determined interactions with three service stakeholder groups: customer focus, staff morale, and service provider confidence. Finally, three service gap perception factors defined better communication according to the key service communication avenues in an ITSM context: communication channels, business understanding and process effectiveness. The DSS generated a service gap perception survey with questions for each of the identified service gap perception factors (see Table 5). Two of this paper's authors worked together to derive the survey questions from the SERVQUAL model. We used a typical 5-point Likert scale (5—strongly agree, 3—neither agree nor disagree, and 1—strongly disagree) to measure responses. The survey questions were then reviewed by a third person (an ITIL expert with over 20 years of senior IT experience) and clarified. We then tested the questionnaire with ICT service managers at a university. The same two authors then recompiled the questionnaire based on the feedback from the test. We performed this exercise to improve the survey instrument's construct validity.

The results from the service gap perception survey explain current service provision as perceived by key stakeholders and allows one to compare different stakeholders' views to highlight service gaps between the provider (process managers and employees) and receiver of services (customers). The results of the service gap perception survey are presented for discussion with all process stakeholders before they collectively make a decision by categorizing IT service processes into five groups: critical, highly important, moderately important, marginally important, or not important.

Table 5: Development of IT Service Gap Perception Survey Questions Based on the SERVQUAL Model			
Service gaps	**Addressing service gaps**	**Service gap perception factors**	**Survey questions**
Service expectation-perception gap (Gaps 1 & 5)	Value proposition	Meeting expectations	The IT service provider meets expectations regarding IT service delivery.
		Budget effectiveness	The IT service provider spends its budget effectively.
		Important partner	The IT service provider is a critical partner in helping to achieve business goals.
Service specification-delivery gap (Gaps 2 & 3)	Degree of confidence	Customer focus	As a whole the IT service provider provides good customer service and addresses business requirements.
		Staff morale	The IT service provider staff present themselves as happy and motivated.
		Service provider confidence	Business has a high degree of confidence in the IT service provider.
Service communication gap (Gap 4)	Better communication	Communication channels	There are adequate channels of communication between business and the IT service provider.
		Business understanding	The IT service provider truly understands and assists business operations.
		Process effectiveness	The IT service provider has implemented effective processes to support IT service delivery.

The perception survey results give IT service managers an opportunity to revisit their understanding and compare and contrast their views with other stakeholder groups. This review is an important step for service managers to obtain an overall understanding of the service gaps not only from their perspective but also with insights from the customers and employees they manage. Such triangulation helps validate data through cross-checking, which promotes reliability and validity (O'Donoghue & Punch, 2003). The idea is to ensure there is good communication across stakeholders about perceived service gaps before they categorize processes in terms of need for improvement.

DSS Implementation

The DSS sends a service gap perception questionnaire by email to all key process stakeholders and plots the survey results in a bar chart categorized by process stakeholder groups.

Following discussions of the results of the service gap perception survey, the DSS is used to score each IT service process based on their relative importance (priorities for process improvement):

- 4: Critically important
- 3: Highly important
- 2: Moderately important
- 1: Marginally important
- 0: Not important.

The maximum score that a process can achieve is 4 (4—critical) and the minimum is 0 (not important). This score, called the “service gap perception score”, provides a metric for the importance of each IT service process based on the service gap perceptions of stakeholders.

Case Demonstration

The case organization used The DSS to conduct the service gap perception survey. Eleven process stakeholders across the three stakeholder groups (service beneficiary, service provider employee and service provider manager) participated in the survey. Figure 4 categorizes the survey results by process stakeholder groups along with the cumulative average scores for each service gap perception factor as the IT service gap profile.

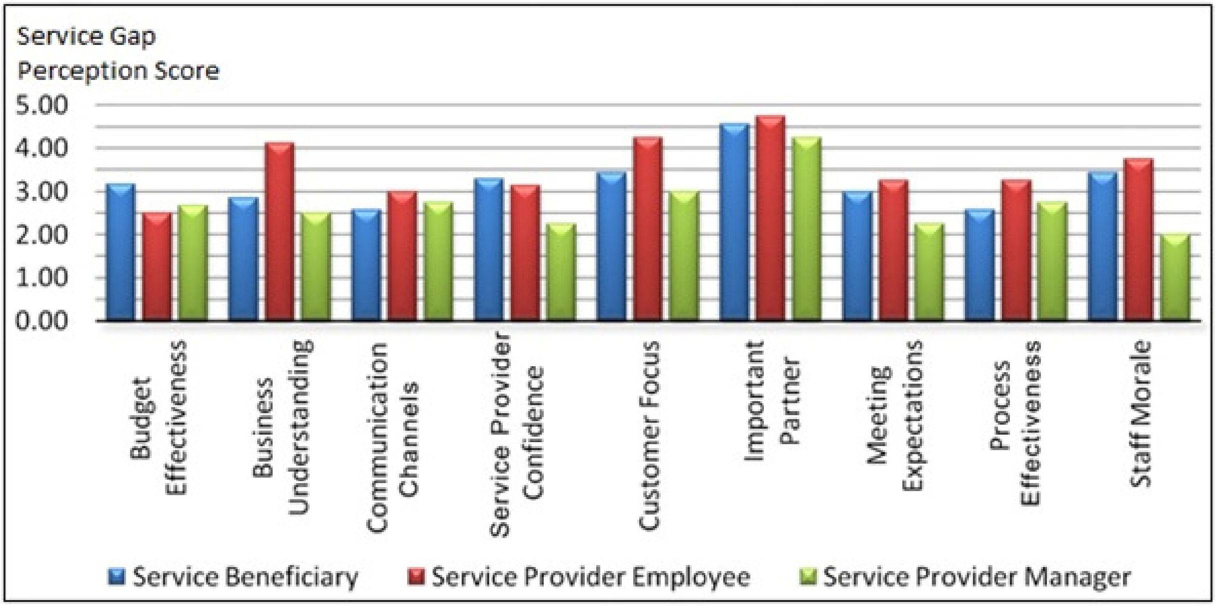

Figure 4: IT Service Gap Profile based on the perception survey at the case organization

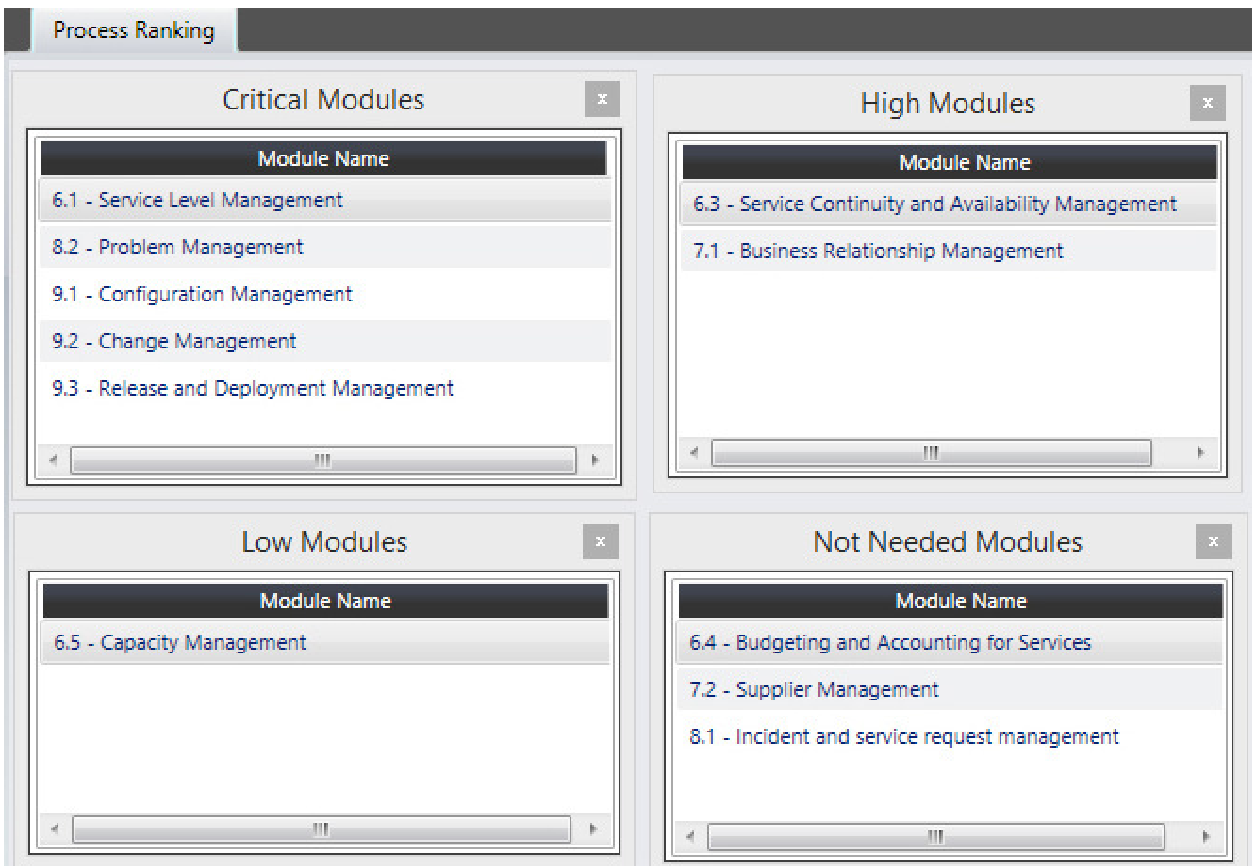

Figure 5: DSS Screenshot to Demonstrate Processes Grouped by their Relative Importance for Improvement (Note: “Modules” in the DSS Refers to IT Service Processes)

We presented the IT service gap profile to all 11 survey respondents and two other senior service managers in a process improvement workshop at the case organization. The IT service gap profile was discussed intensively during the workshop. Many instances of constructive discussions were facilitated by the profile presented during the two-hour workshop. A particularly interesting observation was lengthy discussions about why service employees largely felt that they serve business well while service beneficiary and service provider managers were neutral or disagreed ("business understanding" score in the IT service gap profile in Figure 4). Discussions led to a conclusion that the "service level management" process, which deals with designing IT services according to the agreed service level targets (Hunnebeck, 2011), was critically deficient and needed improvement. This observation is an example of how service perceptions shape discussions to decide IT service processes for improvement.

We also presented all workshop attendees with a process information sheet that defined all 12 IT service processes with their purposes and expected outcomes as outlined in the process reference model in ISO/IEC 20000 (ISO/IEC, 2010). This information sheet and discussions that arose based on the IT service profile gap facilitated the grouping of the IT service processes in terms of their relative importance to improve. The facilitator of the workshop, one of the authors of this paper, used the DSS to categorize the processes based on consensus. Figure 5 illustrates the final grouping of IT service processes based on their relative importance for improvement.

Based on the final grouping of IT service processes as shown in Figure 5, the DSS calculated the service gap perception score for each IT service process as listed in Table A-1 in the Appendix.

Produce a Process Selection Matrix

Method Description

Based on the business driver score (step 2) and service gap perception score (step 3), we plotted IT service processes to produce a process selection matrix. Figure 6 demonstrates the process selection matrix. This matrix represents the major outcome of the entire research process, which we hence propose as a functional design principle (Gregor et al., 2007) with empirical grounding as discussed by Carlsson (2007).

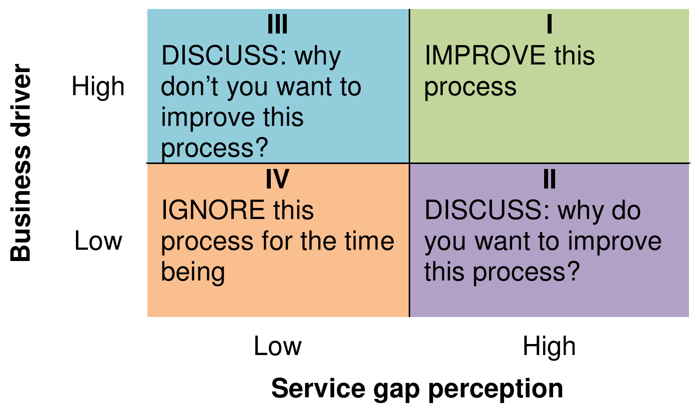

Figure 6: Process Selection Matrix as Design Principle

The process selection matrix can assist IT managers to select processes for improvement. A high score for both business driver and service gap perception means that the IT service process lies in quadrant I: these processes must be seriously considered for improvement. These processes strongly support the business objectives of the organization and are also perceived by key stakeholders as important processes to improve. The higher the position of the process at the upper right corner, the more critical the process is for improvement. Likewise, processes falling in quadrant IV can be ignored since they are not important to business and stakeholders are not interested. Since business priorities and improvement requirements may change frequently in a dynamic IT management environment, processes in quadrant IV may still need to be considered for improvement at a future date.

Processes falling in quadrant II and III should trigger discussions before a final decision is made on whether to select them for improvement. Quadrant II suggests that process stakeholders are keen to improve the process but that these processes are not really important to the business at this stage. Further discussions about these processes should be made in regards to the rationale for choosing them. If business value can be ascertained, these processes can be selected for improvement. Finally, quadrant III suggests processes that have high business value but were not considered for improvement by stakeholders. Discussions about these processes may reveal, for example, that the process may have recently been through an improvement cycle or is being implemented at a satisfactory capability level and, hence, does not require further improvement at that stage.

Overall the process selection matrix provides organizations with evidence-based support to make decisions on selecting important IT service processes to improve. Using this matrix, organizations can demonstrate that a rigorous method has been undertaken to make decisions in selecting IT service processes based on informed choices.

DSS Implementation

The DSS computes the two score values for each IT service process from step 2 and step 3 of the process selection method and presents the process selection matrix. The DSS provides an interface to facilitate the business driver ranking exercise, service gap perception surveys, process rankings, and presentation of the process selection matrix as the major outcome.

Case Demonstration

We generated a process selection matrix for the case organization using the DSS (shown as Figure A-1 in the Appendix). We plotted six ITSM processes in quadrant I, one in quadrant II, two in quadrant III, and three in quadrant IV. We presented the matrix at the case organization to four senior IT managers who had the authority to make decisions about selecting the processes for the process improvement project. The matrix aided their decisions and they selected four of the six processes from quadrant I (6.1 SLM, 8.2 PM, 9.2 ChM & 9.3 RDM). They rejected two other processes on the grounds of resource constraints.

Service managers also selected the only process from quadrant II (9.1 CoM). They intended to improve this process even though it had a lower business driver score. We observed their meeting and noted their discussions that the process in consideration (9.1 CoM – Configuration Management) needed to be urgently improved because they had not revised the process since introducing new software for this process (a configuration management database, see Madduri et al., 2007). This case clearly demonstrates that the process selection matrix helped IT service managers make informed choices regarding their decisions to select IT service processes. As we discuss in Section 5 , the outcome of the process selection method and the DSS were reviewed by case study participants, compared with qualitative evidence, and found to be useful in terms of perceived decision quality and efficiency.

5. ARTEFACT EVALUATION

In this section, we evaluate the utility of the process selection method and the DSS. TTF theory helps in evaluating performance improvements as a result of a good fit between task and technology. We discuss the fit about artefact development in Section 4. We evaluated the fit's performance with semi-structured interviews to examine the perceived decision quality and perceived decision efficiency of IT managers at the case organization. Our initial interviews focused on the utility of the method after following steps 1-3 of the proposed process selection method. We followed this step by presenting the final outcome (step 4) to facilitate making decisions to select IT service processes to improve. We then conducted a follow-up interview to evaluate the effectiveness of the method outcome. We used perceived decision quality and perceived decision efficiency as the two key measures for evaluating the DSS. Researchers have explored these two factors to identify perceived successful use of a Web-based spatial DSS using the task-technology fit as an antecedent (Jarupathirun & Zahedi, 2007) and subsequently used in other Web-based DSS (e.g., Gu & Wang, 2009). We begin by evaluating the utility of the method and outcome of the DSS (design product evaluation) and then evaluate the quality of the entire research process using the DSR guidelines (design process evaluation) that Hevner et al. (2004) proposed.

Evaluation of the Process Selection Method and DSS

In order to conduct a thorough evaluation, we organize our work based on the evaluation strategy that Pries-Heje, Baskerville, and Venable (2008) advocate. The use of established frameworks such as the TTF theory, balanced scorecard, and SERVQUAL models justifies the artefact's design. This is an ex ante artificial setting evaluation that continuously took place during the artefact development process with several iterations of updates (Pries-Heje et al., 2008). We then conducted our evaluation with an ex post orientation by evaluating our artefact in a real case organization.

We followed the steps of the process selection method and obtained experience feedback from the IT managers on the utility of the DSS. The feedback from the IT managers at the case organization was extremely positive about the utility of the DSS and about their perceptions of its decision quality and efficiency. The case organization adopted the DSS and initiated their process improvement project by selecting processes based on the process selection matrix presented by the DSS.

We qualitatively analyzed the initial interview transcripts, which revealed the value of the process selection method in the organization. All IT managers said that the method was very reassuring and would affirm their decisions. Next, we qualitatively analyzed the follow-up interview transcripts to confirm the utility of the DSS and for triangulation as strong evidence of support in proposing the process selection method. Table 6 summarizes the evaluation results.

Table 6: Participant Evaluation of the Process Selection DSS				
Participant	**Perceived decision quality**	**Supporting comments**	**Perceived decision efficiency**	**Supporting comments**
Service Manager 1	☑	Dependable approach	☑	Use of software tool
Service Manager 2	☑	Use of balanced scorecard and the SERVQUAL model	☑	Online surveys
Service Beneficiary 1	☑	Evidence-based decision making	☑	Scalability (asking more people)
Service Beneficiary 2	☑	Decision support using the Process Selection Matrix	☑	-

Each case study participant appeared to find the method and resultant DSS useful for examining and understanding priorities in IT service processes. Regarding perceived decision quality, we found strong support about the decisions made based on the DSS being valid and dependable. Each of the interviews indicated the process selection method and resulting DSS appeared to be valid; in other words, to have a strong face validity (Trochim & Donnelly, 2008). For example:

> *I think it is dependable. This approach will identify which processes satisfy our vision and where our service quality shortfalls exist. From this information, areas for improvement can be identified.* (Service Manager 1)

The use of the balanced scorecard and SERVQUAL model reinforced the quality of the process. The participants seemed especially interested in the ability to survey process stakeholders using the balanced scorecard and SERVQUAL archetypes:

> *If your tool contrasts processes based on the* [balanced] *scorecard and service quality [SERVQUAL model], these are used extensively worldwide… I am sure this allows our processes to be prioritized for improvements looking at business importance and process gaps.* (Service Manager 2)

The presentation of the IT service gap profile and process selection matrix impressed one service beneficiary in particular, who made decisions on authorizing process improvement projects: "it is always easy to interpret visual format to identify where our deficiencies exist … your chart [process selection matrix] can identify the priority with which each process should be improved" (Service Beneficiary 2).

Even though using DSS to assist in selecting processes has a time imposition in contrast to a quick meeting to decide which processes should be selected for improvement, we investigated perceived decision efficiency in terms of clarity and productive outcome of the effort. The DSS appears to be useful in ensuring that resources and costs are well spent on the process improvement initiatives. None of the interviewees considered that the proposed method using a DSS was a waste of time. For example:

> *No, it's time well spent. Surveys are good … they [driver ranking and service gap perception surveys] enable collecting information without having to arrange several meetings, etc. Where we do need to decide on selecting processes, this tool has guided us. I think the tool made our meeting rather more productive.* (Service Manager 1)

All interviewees thought the process was relatively straightforward and productive when the DSS was used. One process user said that using the DSS provided a more "democratic" approach where all staff involved had a say in improvement priorities. He suggested this will ensure that process improvements will be readily supported by everyone since everyone discussed this from the beginning. He prominently voiced his views of the efficiency of the DSS:

> *Your tool gives more truthful answers about our organization. You can ask more people [about] improvement priorities, scorecard* [business drivers]*, etc. I am impressed how your software [DSS] assists in making decisions to select* [processes to improve]. (Service Beneficiary 1)

We argue that application of the process selection method becomes easier after it is first implemented and, thus, that it enables more efficient process selection for future process improvement projects. For example, in step 1, we used a simple approach to identify the initial ITSM processes for improvement. Repeatedly using the DSS to select

IT service processes from the same list does not require performing this step again. Similarly, the selected business drivers in step 2 may not change significantly over a new improvement cycle in a short period of time; therefore, once this is done, step 2 may not need to be repeated to the same degree of detail for future process selection decisions.

In general, the DSS exhibited strong face validity, which we can see from the participants' comments attesting to its ability to assist in decision making. The outputs also appeared to have strong reliability, which we can see from the findings from case evidence and academic literature. In addition, participants perceived the DSS to be valuable for enabling initial communication about improving initiatives for IT service processes.

Evaluation of Research Process

The preceding development and evaluation of outputs of the process selection method indicate that it has met our requirements of being theoretically grounded, balanced, and competently supported by a DSS. Hevner et al. (2004) expand on these requirements in describing seven guidelines to evaluate design processes in Information Systems. Table 7 describes how we addressed each of their guidelines.

Table 7: Design Process Evaluation (Based on Hevner et al.'s (2004) Guidelines)

Guideline	Research work
Create an innovative IS artefact in the form of a construct, model, method, or instantiation.	The process selection method is an innovative method because it is the first to provide a balanced technique using factors of business objectives and service gap perceptions in choosing IT service processes for improvement. The DSS is an instantiation of the proposed method, which makes it readily accessible for practitioners to select IT service processes.
Provide a solution to an important and relevant business problem.	We argue that the ambiguity in scoping process improvement projects due to a lack of clarity in the process selection method requires a "theory for design and action" (Gregor, 2006) for understanding priorities among IT service processes not only based on business objectives but also examining what process stakeholders think based on perceived service gaps.
Use a well-executed evaluation to demonstrate the utility of the design artefacts.	An analysis of the existing process selection methods, theoretically grounded frameworks, implementation of the DSS, and evidence from interviews in a case study were all part of the evaluation to assess the utility of the constructed artefact.
Research contributions are clear, verifiable, new, and interesting.	The demonstration and evaluation of the DSS indicate the method can provide evidence-based decision support in selecting IT service processes compared to existing approaches (see Section 2) in and beyond the ITSM field.
Construction and evaluation of the design artefact is justified using prior theory and evaluation is conducted with rigorous research methods.	The design and development of the process selection method and the DSS described in the preceding section include a careful justification of each step using prior theory and evidence from the case studies.
Use an iterative search for an effective solution to the problem.	This study used ongoing comparisons between existing process selection frameworks, method development based on theoretical background, and case study evidence in an iterative cycle to develop a valid and useful DSS.
Communicate the results effectively to technology-oriented and management-oriented audiences.	Throughout the research work, we engaged ITSM practitioners and academics and obtained participant feedback to ensure the DSS is accessible to both researchers and practitioners and can produce outputs that are useful for guiding communication to choose the right IT service processes for improvement.

6. DISCUSSION AND CONCLUSION

Contributions to theory

We argue that our process selection method is an important contribution as a "theory for design and action" (Gregor, 2006). First, the method clarifies and extends prior guidelines by providing a fine-grained approach to selecting critical IT service processes for improvement. In contrast, prior studies have typically included process selection as a mere step without any methodological guidelines or DSS support. The process selection method also clarifies the importance of using two key decision factors (business objectives and service gap perceptions) while considering processes for improvement. Furthermore, the process selection method justifies 1) using the balanced scorecard and SERVQUAL models and 2) using the task-technology fit theory for conceptualizing the fit between the decision task at hand and DSS technology dimensions.

This research contributes to the existing literature by operationalizing a task-technology fit construct for decision tasks regarding process selection using a DSS in the context of ITSM. Moreover, we extend DSS performance evaluation using perceived decision quality and perceived decision efficiency factors that have been used in other similar Web-based DSS technologies (e.g., Jarupathirun & Zahedi, 2007). This paper further contributes to knowledge on ITSM. Despite being critically important to the success of many firms, leveraging technology to advance service management has received insufficient attention in the empirical literature despite growing industry adoption of ITSM (Galup, Quan, Dattero, & Conger, 2007; Ostrom et al., 2010). By developing clearer ways to select IT service processes based on the business objectives and service gap considerations, this research helps clarify unique challenges in decision making regarding process selection choices and furthers our understanding of a consistent method for overcoming such challenges.

Finally, this research makes an important contribution to research methodology by demonstrating a DSR approach to develop an empirically and theoretically grounded method facilitated by a DSS. The detailed explanation of research methods, prior theories, expository examples, and case study evaluations provide an example of how to confront the challenges of presenting design work for a novel method. Drawing on extant design science research methodology (e.g., Gregor et al., 2007; Hevner et al., 2004; Peffers et al., 2008), the approach is well suited to address calls for IS research to balance the dual requirements of rigor and relevance (Benbasat & Zmud, 1999; Rosemann & Vessey, 2008; Straub & Ang, 2011).

In terms of theoretical contribution, this research is arguably the first to integrate TTF theory and DSR method. This paper also demonstrates how intensive research methods such as an in-depth case study for evaluation can be combined with iterative design of an artefact as a credible research activity. Based on our extensive review of literature on ITSM process selection methods, we found no well-established theories to support this method, and its application in industry is largely left to organizations and consultants to decide in an ad-hoc manner. In contrast, the process selection method supported by the DSS has good descriptive and prescriptive utility by providing outputs that are readily actionable.

Implications for practice

From a practical standpoint, the clearly defined process selection method enabled a DSS to be developed that can calculate scores for making quantitative measurements of factors such as business objectives and service gap perceptions. We demonstrate how the process selection method is applied in practice by developing a DSS to implement the method in an IT service organization that was working to initiate a process improvement project. The widely popular ITIL® framework and the international standard for ITSM ISO/IEC 20000 fail to provide guidelines or requirements for selecting processes. By providing a structured approach to select processes for improvement, this paper addresses the literature gap in the continual service improvement literature of ITSM.

A significant benefit of using the process selection method is that practitioners can gain a better understanding of the workflow to select IT service processes. This also helps an organization to avoid wasting scarce resources on improvement efforts for processes that are not important to business and/or considered unnecessary to improve by key stakeholders. Similarly, when organizations evaluate new or existing IT service processes for improvement, they can use the DSS to assess the degree of importance of each process to the service stakeholders. This can help decision makers reduce the risk and uncertainty in ITSM process improvement implementations while maximizing return on investment for such projects.

Organizations can use the artefact as an evidence-based tool to support decisions on selecting important processes to improve. Process improvement projects can be disruptive in organizations and, hence, it is important to secure management buy-in early in the project (Hunsberger, 2012). The artefact provides informed choices to assure top management that a structured method is followed to select relevant processes for improvement. Furthermore, practitioners can use the process selection matrix to highlight business-IT alignment in terms of IT service processes that are tightly integrated with business objectives. For instance, in a business that uses IT services for their critical operations, the matrix can demonstrate the business value of IT service processes.

The case study also revealed additional findings that have implications for practice. For example, when senior IT management is faced with several processes to be overhaul, they tend to struggle to deal with such decisions due to lack of specific guidelines. The DSS presented a solution to this decision task in a transparent manner by providing measurement scores for decision priorities so that processes that score highly can be considered for improvement.

Limitations and Future Research

A collaborative effort between academic researchers and industry practitioners has facilitated development of the DSS. Even though the proposed process selection method provides a structured set of activities to identify recommended processes to improve, the final decision to select processes is made by the incumbent decision makers for the improvement project. Moreover, to address construct validity, the surveys in the DSS should be able to collect information from different process stakeholder groups, otherwise the selection of business drivers and understanding of service perception may be biased.

We evaluated the DSS in only one case organization. Despite applying academic rigor and industry experience, we cannot generalize how well this method and the DSS perform across different organizations since the potential dependency of the process selection matrix on different organizational contexts has not been studied. Although the IT service managers in the single case study provided positive feedback and accepted the recommendations from the DSS, how well this artefact contributes to actual service improvements is not yet known. In order to get a richer view of integration of the DSS, future research should apply the artefact in other organizations in order to confirm and generalize the applicability and effectiveness of the method. Since we focused in detail on the definition of the problem and construction of an artefact, the evaluation aspect of the research is limited in scope compared to studies that use existing artefacts for evaluation (Gregor et al., 2013). Future research could consider feedback cycles from several iterations of evaluation. This should lead to a robust method defined as a design theory (Gregor et al., 2007) or a process theory (Markus & Robey, 1988) capable of guiding decisions regarding selection of processes for improvement in any domain beyond ITSM.

We cannot claim this is the best process selection method for all organizations to follow. The best approach could include a combination of multiple factors beyond our proposal to use business drivers and service gap perceptions. Other variables such as risks, external audit, compliance, and cost/benefit analysis to analyses external and internal business environments can be considered to identify critical areas. However, we contribute to literature with the approach we took to carefully address the challenges of a decision task and how a DSS can facilitate a structured method in doing so. Researchers can expand the proposed DSS to deal with complex decision tasks with multiple factors in a multi-criteria decision making scenario. These concepts can still be implemented with the analytic hierarchy process framework used in our DSS.

We focus only on perceptual decision evaluation factors (perceived decision quality and perceived decision efficiency). Several prominent studies have supported the relationship between TTF theory and perceived decision quality (e.g., Todd & Benbasat, 1999; Zigurs et al., 1999). We did not include actual decision outcomes, such as the repeated use of the DSS and process improvement effectiveness attributed to process selection, since these constructs require longitudinal data and complex causal relationships that was beyond the scope of this research. The actual performance improvements can only be evaluated after observing the outcome of ITSM process improvement projects. Future research should include more objective performance measurement of the proposed method and DSS.

IT service processes are well suited for testing the utility of the process selection method because there are several well-defined processes designed for improvement in ITSM (ISO/IEC, 2011). We expect that, since most other types of management systems have adopted the process approach principle (e.g., business process management, IT governance), it should be fairly straightforward to select processes for improvement in those domains based on our process selection method by configuring the proposed DSS with different decision factors as required. For example, COBIT® is a popular framework for the governance of enterprise IT that has 37 defined enabling processes (ISACA, 2012). In order to select COBIT® processes for improvement, one could use the process selection method with two (or more) factors: (1) business drivers as used in our DSS and (2) a new factor: stakeholder perception of enablement of IT governance for improvement. Thus, future research could consider using the proposed model in other fields such as IT governance to support global e-business models (Carlsson, 2005).

Obviously, the actual performance of process improvement projects is dependent on several external organizational factors such as top management's commitment, budget, and priorities for undertaking improvement activities, the improvement plans' effectiveness, regulatory and compliance reasons, requirements for certification, risk management, and so forth. We did not consider these factors in our current proposed method. Nevertheless, we have laid a foundation for applying DSS in process improvement activities and it is certain that future evaluations and improvements to our artefact can make further contributions in this area. The design science philosophy recognizes the need to select appropriate evaluation methods of artefacts iteratively in the real-world environment (Peffers, Rothenberger, Tuunanen, & Vaezi, 2012). A more lengthy and rigorous method would involve reviewing other decision factors that organizations might consider while selecting processes to improve.

Reflecting on our experience in this study, we found the DSR method valuable for proposing novel methods that require intensive pilot testing due to immature or non-direct prior theories. The DSR approach, with its careful attention to evaluation of theories and artefacts, encourages researchers to more clearly define the research problem space and solution space (Venable, 2006) before confirmatory studies proceed. Finally, future research should consider applications of design theories, such as those used in the DSS developed in our research, to confirm or refine propositions to further extend knowledge on the utility of DSS for businesses.

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APPENDIX

Process scores and process selection matrix for case study organization.

Table A-1: Process Scores for Case Study Organization

IT service process (ISO/IEC 20000)	Business driver score (0 -16)	Service gap perception score (0-4)
6.1 Service level management (SLM)	11	4
6.3 Service continuity and availability management (SCAM)	12	3
6.4 Budgeting & accounting for services (BAS)	5	0
6.5 Capacity management (CaM)	9	1
6.6 Information security management (ISM)	7	2
7.1 Business relationship management (BRM)	11	3
7.2 Supplier management (SM)	7	0
8.1 Incident and service request management (ISRM)	12	0
8.2 Problem management (PM)	13	4
9.1 Configuration management (CoM)	6	4
9.2 Change management (ChM)	10	4
9.3 Release and deployment management (RDM)	13	4

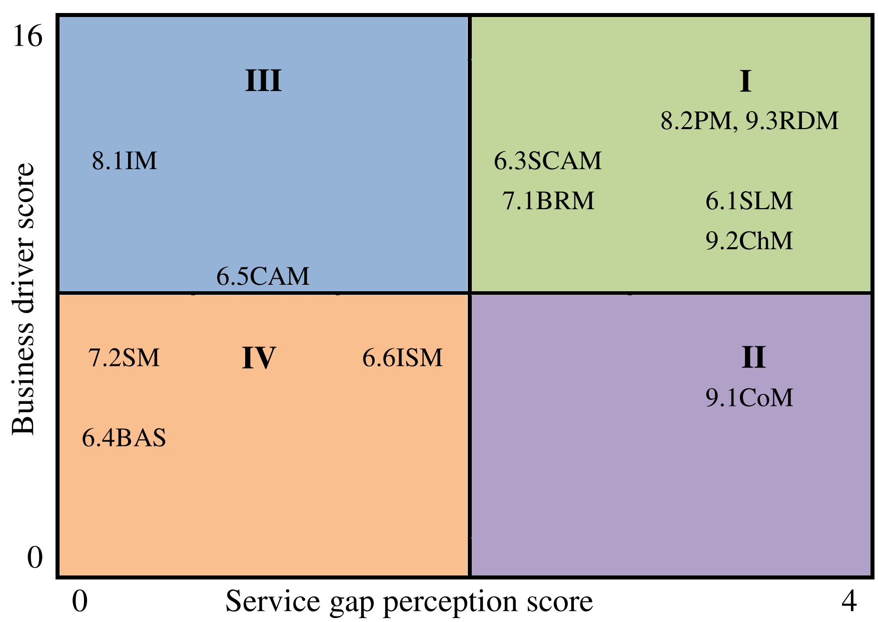

Figure A-1: Process Selection Matrix For Case Study Organization

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