

An Information System Design Product Theory for the Abstract Class of Integrated Requirements and Delivery Management Systems

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Abstract

Information and Communications Technology-enabled international sourcing of software-intensive systems and services (eSourcing) is increasingly used as a means of adding value, reducing costs, sharing risks, and achieving strategic aims. To maximally reap the benefits from eSourcing and to mitigate the risks, providers and clients have to be aware of and build capabilities for the eSourcing life-cycle. China is in a position to become a superpower for eSourcing service provisioning, but most Chinese eSourcing service providers are small or medium-sized and typically work for larger intermediaries instead of end-clients, limiting their business and capabilities development. The extant literature does not offer a comprehensive enough guidance for eSourcing life-cycle management to overcome this limitation. This paper presents an information system design product theory for the abstract class of Requirements and Delivery Management Systems. eSourcing service providers can use it to establish domain-specific design product theories and to instantiate them into information systems that support the design, service provisioning, and breakdown recovery within the eSourcing life-cycle.

1. Introduction

International sourcing is used worldwide to gain comparative cost advantage and outside expertise, to improve services, and to gain access to technology [1]. More than 50% of American Fortune 500 firms and an increasing proportion of Western European and Japanese firms are users of offshore software sourcing [4]. India, Russia, Philippines and China are the important nations for service provisioning [5,6]. The use of Information and Communications Technology (ICT) is crucial in international sourcing.

The offshoring of services is critically dependent on a supply of providers that have operational and strategic capabilities to offer comparative cost advantage, satisfactory quality, and on time delivery despite the differences in time zones and culture [3].

There is already a myriad of Chinese eSourcing service providers in the global market and their role is increasing quickly. Yet, there is relatively little research focusing on the Chinese eSourcing service provisioning industry.

The purpose of this paper is to report the status of the core deliverables of the doctoral dissertation project (hereafter, “project”) of the first author and to invite criticism and feedback to improve the quality of the resulting dissertation. The project focuses on Chinese providers, but it aims at reaching results generalizable to providers in other nations with powerful eSourcing industries.

Language and time zone issues do not hinder Chinese providers from entering the western eSourcing markets [18]. Chinese providers need to improve mainly their business development and process capabilities and enabling information systems. Most importantly, Chinese client organizations must further develop their eSourcing cultures so Chinese service providers can have large and demanding domestic markets that stimulate and provide financing for the design and productization of innovative and competitive services and products [21]. Therefore, comprehensive advice is needed to help service providers to focus on the most value adding business strategies, eSourcing life-cycle phases, activities, and enabling classes of information systems that best improve their capabilities for service design and provisioning.

The extant literature does not offer a comprehensive enough guidance for eSourcing management in the Chinese context. It focuses on clients from the US and Europe [13]. Providers’ perspective has not been studied sufficiently [2,7]. American and European enterprises are familiar with the large Indian companies and their sourcing services. The global sourcing research is also limited to the service model Indian providers use mainly with their American clients [11,20]. The lessons learnt are not necessarily applicable to Chinese providers. Most Chinese providers leverage the mediated offshore outsourcing business model, whereby a small or a medium-sized Chinese provider delivers offshore software services

to a larger foreign ICT client that contracts and interfaces with the actual end-clients onshore [10]. This business model usually restricts the providers to small, low-value projects and hampers the sharing of knowledge with end-clients, severely impeding the capability and business development of Chinese providers. The extant literature does not extensively address this business model and ways to overcome its limitations. Järvenpää and Mao [10] focus on the development of client-specific, process, and human resource capabilities, but their research does not cover the entire eSourcing life-cycle and cannot enhance providers' capabilities comprehensively.

eSourcing can be divided into two categories: ICT services sourcing (ICTS) and business process sourcing (BPS). ICT sourcing occurs when an organization contracts one or more providers to perform an ICT function instead of performing the function itself. The provider can be a third party, another division, or a subsidiary of a single corporate entity [9]. BPS involves the sourcing of noncore ICT-enabled business processes to internal or external providers. It enables clients to focus on their primary business operations and to achieve lower costs, improved productivity, and more flexible staffing options [19].

This project studies one service provider in each of the ICTS and BPS categories using the case study research methodology. It aims at providing as generalizable scientific knowledge as possible concerning the most important business practices, activities, and classes of information systems for eSourcing (1) ICT services and (2) business processes. The project investigates the two contexts, respectively, through the following two eSourcing project domains in the Chinese eSourcing market: (1) software testing services and (2) third-party logistics (3PL) services. The two research cases are Ltesting (<http://www.osourcing.net/>) and PG Logistics (PGL, <http://www.pgl-world.cn/>).

Ltesting is a medium-sized (less than 50 employees) professional software testing services provider [17]. It has been chosen for this project because it has established a leading position in the Chinese testing service market based on its testing experiences from multiple domains (e.g., banking, insurance and telecommunications) and professional services. There are two reasons for selecting PG Logistics (PGL) as the second research case. First, PGL is the most influential third-party logistics enterprise in the Chinese market and the first Chinese company to use modern logistics concepts to provide integrated logistics services. Second, PGL has developed its own flexible and scalable third-party logistics information integration platform.

Extensive communication, coordination, and collaboration are required between the stakeholders involved in the eSourcing life-cycle. Numerous information systems are typically needed. Without adequate integration of these information systems, information quality will deteriorate, leading to potentially expensive breakdowns disrupting services and reducing service effectiveness. This project creates information system design *product* theories (hereafter, "design product theory") that help providers to design and integrate the most crucial classes of systems that support the end-to-end eSourcing life-cycle. A complete information system design theory (ISDT) prescribes both the product and process aspects of a class of information systems, that is, *what* are the meta-requirements and the meta-design for all the products instantiating the class; which kernel theories from reference disciplines are vital to determine what all the products should do, and *how* the products should be built [23]. ISDTs make the development of products more tractable for application developers by focusing their attention and restricting their options and help organizations to source products from commercial and open source markets. The project focuses on information system design product theories prescribing the product aspects for the classes of systems because system instances can often be built in many ways and it is thus not as fruitful to prescribe the process aspects as the product aspects.

In the context of software testing services, most commercially available information systems support the eSourcing life-cycle only from the providers' viewpoint and provide limited support for clients. They are used separately for requirements management, test execution management, or defect management. Standardized data transfer between the different information systems supporting specific life-cycle phases is difficult, reducing service effectiveness and raising the risks of failure. This research project has developed an information system design product theory for the class of Requirements, Test and Defect Management Systems (RTDMS) to support knowledge management throughout the eSourcing life-cycle for testing services [15].

In the context of third-party logistics services, there are few studies on small and medium-sized 3PL providers in the Chinese logistics market [8,14]. 3PL providers have become increasingly important because they participate in clients' supply chains for providing logistics management [14]. Therefore, it is necessary for small- and medium-sized 3PL providers to improve their communication and operations to offer services more effectively. This research project has developed an information system design product theory for the class of Order, Transportation

and Warehouse Management Systems (OTWMS) to help clients and service providers to design, execute, manage, and control transparent and seamless logistics processes [16].

The project draws upon the two design product theories and the cross-case analysis to create an information system design product theory for the class of Requirements and Delivery Management Systems (RDMS). It helps both ICT services sourcing and business process sourcing service providers to design information systems for managing the end-to-end eSourcing life-cycle.

It is important to establish and execute efficient business models and processes throughout the eSourcing life-cycle and to recover from unanticipated coordination breakdowns quickly and effectively [12]. By analyzing breakdowns and their underlying causes, researchers and actors in the workplace can identify the problems that are not easily visible in normal routines and create new knowledge to solve such problems. Redesigning the eSourcing life-cycle when necessary ensures organizational survival, proactive elimination of some breakdowns, and effective long-term enactment of routines [12].

The project addresses the research question: which eSourcing practices, associated activities, and enabling classes of information systems are the highest priority ones for service providers from the viewpoint of executing the eSourcing life-cycle, recovering from coordination breakdowns during execution, and redesigning the life-cycle practices, activities, and systems to ensure organizational long-term effectiveness [12]? To answer this question, eSourcing practices, associated activities, and enabling classes of information systems are analyzed holistically as work systems.

This paper is organized as follows. Section 2 presents the research methodology and the kernel theory. Section 3 presents the meta-requirements for RDMS, that is, the practices and involved stakeholders in each phase of the eSourcing life-cycle that must be supported by the RDMS instances. Section 4 describes the meta-design of the design product theory for RDMS and validates it based on RTDMS and OTWMS theories. The last section concludes the paper and suggests topics for future research.

2. Research methodology and kernel theory

This project classifies eSourcing practices into ICTS and BPS categories and studies each category through a case study. After that, in the cross-case study, this project summarizes the common and variable aspects among these categories and drafts the design product theory for the class of RDMS.

The eSourcing Capability Model for Service Providers (eSCM-SP) is a kernel theory of this research project because it is the most comprehensive eSourcing model available for service providers. According to eSCM-SP, the life-cycle involves three phases. (1) Initiating an engagement involves gathering and negotiating requirements with a client, contracting, and designing, resourcing, and deploying the service. (2) Service is delivered according to the commitments established for the engagement. (3) The engagement is completed primarily by transitioning the resources from the provider to the client or to a third party [22]. Specific practices are enacted in each phase. eSCM-SP is applicable to both ICT and business process eSourcing and can help service providers improve their capabilities related to both ongoing, phase specific, and engagement specific eSourcing practices throughout the eSourcing life-cycle [22]. Yet, eSCM-SP has not been used and studied extensively in China. We expect only a relatively small subset of the best practices envisioned in eSCM-SP to be relevant for Chinese service providers, mainly because most providers are in relatively early phases of eSourcing capability development and thus cannot use the most advanced practices of eSCM-SP.

During both case studies and the cross-case study, the authors have analyzed the data by iterating between two phases. First, the data about the routines and the information systems they use, the most significant breakdowns in routines, and the processes and information systems used for recovering from breakdowns have been compared to the eSourcing phases and practices prescribed by the eSCM-SP. The project is especially interested in breakdowns that are caused by poorly designed, poorly used, and/or entirely missing computer-based information systems. Interactions between the eSourcing strategy, activities, processes, organizational structures, and information systems have been analyzed to define the most important information systems for the eSourcing life-cycle and its phases. Second, the results have been shown to the managers and the staff of the case companies to collect feedback, revised as necessary, and summarized. In the cross-case analysis, the common and variable parts of RTDMS and OTWMS have been compared and analyzed with respect to each phase of the eSourcing life-cycle. For example, through comparing the service providers' practices and the support offered by RTDMS and OTWMS in the initiation phase, the common and variable parts have been analyzed to draft the requirements management service of the design product theory for the abstract class of Requirements and Delivery Management Systems.

Generally, eSourcing service providers have teams to execute the specific services. Based on the case studies and eSCM-SP, this project focuses on the requirements management and delivery management teams (Table 1). These teams need to work together, for example, to process and analyze client requirements, to draft eSourcing service plans, to deal with service breakdowns, and to change service plans. In order to track the service engagements and to monitor the performance of providers, the eSourcing life-cycle should be transparent to clients.

Table 1. Responsibilities of key eSourcing service provisioning teams

Team	Responsibility
Requirements management team	Team is responsible for transforming clients requirements to executable requirements, requirements prioritization, and management. It makes the eSourcing service plan together with the delivery management team. During the delivery phase, it coordinates with the delivery management team and deals with service breakdowns. It is responsible for communicating with clients.
Delivery management team	Team executes the service delivery according to client requirements, drafts the eSourcing service plan together with the requirements management team, and reports service breakdowns (e.g., delays, accidents, and out-of-budget events). It collects metrics and deals with breakdowns during the service. During the service completion phase, it documents the services and the lessons learnt and transfers resources to clients or third parties.

The design product theory for the class of RDMS has been created based on a literature review and the analysis of the RTDMS and OTWMS. RDMS has been designed to be abstract and generic enough so eSourcing providers can use it to design domain-specific information systems and improve their processes and information systems regardless of their current practices and systems. Providers can thus use even separate requirements management and delivery management systems and use the theory to better integrate and organize these systems for enabling the end-to-end eSourcing life-cycle. For example, an RDMS instance can track the requirements execution process against the service plan and report execution

results and breakdowns. It does not need to help execute specific tasks but it needs to track and report the results of the tasks. Specific tasks can be run by using other management tools. Therefore, the analysis of the practices and information systems of the case companies has helped us to scope the design product theory for the class of RDMS appropriately.

3. Meta-requirements of the design product theory for the class of RDMS

This section describes the meta-requirements of the design product theory for the class of RDMS, that is, what services integrated requirements and delivery management systems must provide to enable stakeholders to streamline the end-to-end eSourcing life-cycle (Figure 1). RDMS shall offer two categories of services: (1) requirements management and (2) delivery management (Table 2). Requirements management deals with, for example, requirements prioritization and management. Prioritization refers to establishing priorities for requirements based on client requirements and business risks (e.g., lowest cost, most effective). Requirements management is responsible for a variety of issues such as transforming client requirements to specific executable requirements, arranging proper resources for realizing the requirements, and enabling clients to track service progress. If clients change the requirements or there are unexpected breakdowns due to, for example, the unavailability of critical service components, requirements management should adjust and re-prioritize requirements as necessary. Delivery management is responsible for delivering the service according to the agreed-upon engagement, identifying and tracing breakdowns and their causes during the service, and reporting the breakdowns and their impacts. In the completion phase, delivery management needs to transfer the resources to clients or third parties and to record the lessons learnt for improving future services.

3.1. Initiation

In the initiation phase, a client provides a request for proposal (RFP) and documented requirements for the project. The service providers need to analyze the proposal and requirements to create a business case for estimating the profitability of the service. If the service is profitable, the providers will draft service plans to bid. Clients will analyze the plans, choose the proper providers, sign the contracts and transfer resources to the chosen providers. Providers will

arrange proper staff for the services and offer training to develop the necessary skills.

Table 2. A framework for categorizing the services of the design product theory for RDMS

Requirements management	Delivery management
1 Prioritize requirements based on client needs and business and technology risks	1 Monitor the delivery progress against the service plan
2 Collect requirements from previous similar services to reduce duplication	2 Report execution results and delivery breakdowns
3 Manage interdependencies between requirements and align requirements, service delivery, and related resources.	3 Collect metrics and identify and trace breakdowns during the services
4 Provide clients with requirements status.	4 Generate a delivery results report
	5 Record lessons learnt for further services

Requirements analysis and management are the main activities throughout the eSourcing life-cycle. The requirement database enables a RDMS instance to manage prioritized requirements and provide real-time requirements information and associated delivery and breakdown information to evaluate the service quality and progress. Furthermore, bidirectional traceability is supported between requirements and delivery information artifacts across the eSourcing life-cycle.

3.1.1. Prioritizing the requirements based on business priorities and risks

Providers will analyze the RFP and client requirements. The stakeholders from clients and providers need to work together to analyze the priorities of requirements. Requirements and delivery management systems help them to prioritize requirements based on business priorities and risks.

3.1.2. Collect and analyze requirements from previous service engagements to reduce duplication

Requirements and delivery management systems collect relevant artifacts from each engagement between a provider and a client. Providers analyze the client requirements and search for relevant artifacts from previous engagements to reduce time and costs involved in creating suitable service plans, to estimate the needed efforts and resources based on previous experiences, and to price the services. After that, they draft the service plans and bid. Clients

review the bids and service plans, and then select the proper service providers. After the contracting has been completed, clients will send relevant resources to the selected providers who will schedule and execute the delivery services.

3.1.3. Assign requirements to suitable teams and prepare the delivery services

After the requirements management team receives the client requirements, it needs to validate that the client requirements are executable, ensure all the required information is included, schedule the services, and send the requirement information to the stakeholders for preparation. After that, the delivery management team knows the relevant information and prepares for service delivery.

3.2. Delivery

In this phase, delivery management teams are responsible for executing specific delivery services. Clients and service providers can track the delivery processes and obtain the relevant information in a timely manner through RDMS. The delivery process includes various stakeholders. The execution of the process involves the coordination of the flow of information, services, and related activities among the stakeholders. It is important to manage the eSourcing life-cycle effectively to meet the delivery performance expectations of the stakeholders.

Requirements and delivery management systems enable clients and providers to communicate effectively and seamlessly throughout the delivery phase. For example, the information about the requirements that have been met can be shared with stakeholders to adjust resource allocation. In addition, the systems enable clients and providers to deal with breakdowns quickly. For example, whenever services are delayed, clients and providers may share knowledge to find out the reasons for the delays and to reach possible solutions. The systems record all the breakdowns to help both clients and providers to improve their performance.

3.2.1. Delivery execution

Requirements and delivery management systems support all the activities in the delivery phase. For example, they can track the services systematically and send service breakdown reports and real time delivery status information to stakeholders. They must collect metrics to measure the providers' performance in order to improve performance and to help clients to track service progress.

Delivery management is responsible for identifying and managing breakdowns, executing and monitoring the service delivery, maintaining the service routines, and storing the lessons learnt and the artifacts created into the database for reuse and adaptation during the delivery of services in future [12]. When breakdown information has been collected, it is stored in the database. Requirements and delivery management systems use the databases to provide delivery management teams with proven and reusable artifacts for executing routines and dealing with breakdowns, facilitating effective routine work.

Requirements management teams help delivery management teams to execute the services and to ensure the effectiveness of routines. Delivery management teams create reports and other artifacts, collect metrics, and store them in the databases. They deal with breakdowns and summarize the lessons learnt.

3.2.2. Service Breakdowns

Whenever service breakdowns happen, requirements and delivery management systems send relevant information to the stakeholders that need to communicate with clients and adjust the service plans as necessary. Clients will estimate the influence of breakdowns and decide whether to change their requirements and service plans. If they change the requirements, they have to adjust the service plans and negotiate with providers as necessary.

3.3. Completion

The completion phase starts when clients have received the services they need. Providers can then prepare for transferring the services to the clients or third parties. Clients need to check the services to determine whether they meet the service closure conditions. If the conditions have been met, the engagement between the client and the provider can be closed. The client needs to pay for the services according to the original agreement and the realized service quality (e.g., on time and within the budget). When the provider's financial department will receive the payment, the provider can close the engagement, summarize the lessons learnt, and compare the performance during the engagement with earlier measurement results to improve their service capabilities. For example, requirements and delivery management systems should be able to benchmark the performance with domain-specific industry standards and previous performances and report the results to delivery management teams and other stakeholders.

Requirements and delivery management systems store relevant information artifacts for future reuse. The artifacts to be stored include requirements, schedules, service plans and metrics, helping providers to improve their delivery management and performance.

4. A meta-design of the design product theory for the class of RDMS

This section describes the meta-design for the class of Requirements and Delivery Management Systems based on the meta-designs for the classes of RTDMS and OTWMS, the literature review, the eSourcing life-cycle, and the case studies. Figure 1 visualizes how the meta-design covers the eSourcing life-cycle outlined in section 3. The section concludes by explicating the linkages between the requirements management and delivery management subsystems to validate the meta-design and to justify its scope.

The two main classes of artifacts managed by the requirements and delivery management systems are the Requirement artifact and the Delivery artifact. The relationships between these artifacts are explained next. Requirement is based on client requirements and RFPs. Each Requirement needs at least one Delivery artifact to complete the service. Each Delivery artifact links with at least one Requirement.

This section introduces generic structures and attributes of the two classes of artifacts presented above. According to the design product theory, the subclasses and instances of RDMS should include at least these structures and attributes to be effective.

4.1. Requirement

Table 3 presents the generic structure of the Requirement artifacts. In the following, each class within the structure is explained.

Description describes what a requirement is about, the purpose of the requirement, and the schedule for its delivery. If there are service breakdowns that lead to changes in requirements, clients may send new requirements and providers need to renew the service plans to execute the services. Name and ID are used for identification and traceability.

Origin describes the client requirements the requirement is based on. One client requirement may be transformed to several executable requirements.

Analysis is used to probe the implications of the requirement. *Priority* is used to rank requirements and to allocate appropriate resources. During the service delivery phase, *status* can be used to check the requirements status (e.g., delivered or not).

Workflow describes what should be done next to this requirement and by whom. Requirements management teams need to allocate each requirement to one or more delivery management services.

History is used to provide information about the responsible managers and all prior edits of requirement attributes. As a result, the stakeholders can be held accountable for their actions and unexpected service breakdowns can be dealt with effectively. Changed requirements may necessitate unexpected revisions of service plans and raise service risks. History information helps service providers to eliminate many breakdowns proactively and to recover from breakdowns.

Table 3. Generic structure of a Requirement artifact

Class	Questions	Attributes
Description	What is the requirement about?	Name, ID, Description, Required date and time of delivery, Rationale
Origin	Which client requirements does the requirement refer to?	Author, Source, Date of creation
Analysis	What are the implications of the requirement?	Status, Required effort, Priority, Scheduled date and time of delivery
Workflow	What should be done to this requirement next? By whom?	Assigned Delivery services, Responsible person, Realized requirement closure date and time
History	What has been done to the requirement artifact? When?	Information about all prior edits, editors, and changes

4.2. Delivery

Table 4 presents the generic structure of the Delivery artifacts.

Description describes the purpose of an executed delivery. Process indicates the processes needed for the delivery service, including the expected results and any service breakdowns.

Origin describes the requirement(s) the delivery service refers to. One requirement may need more than one delivery service.

Analysis is used to probe the implications of a delivery service. If a delivery breaks down, the reasons for and influences of the breakdown, the

solutions applied, and the effects of solutions can be documented here and/or in a separate incident management system. This information can be reused in future to help providers and clients to optimize service plans and to improve service effectiveness. *Priority* describes the priority of the delivery service and *status* refers to the delivery progress (e.g., routine, paused by a breakdown, or repairing a breakdown). Required effort describes the delivery costs, time, and resources, which can be used to calculate the total service cost of an engagement. This information can be reused to estimate the profitability and feasibility of future engagements.

Table 4. Generic structure of a Delivery artifact

Class	Questions	Attributes
Description	What is the delivery service about?	Name, ID, Description, Rationale, Process, Required date and time of delivery
Origin	Which requirement does the delivery service refer to?	Author, Source requirement, Date of execution
Analysis	What are the implications of the delivery service?	Status, Required effort, Risk, Priority, Scheduled date and time of delivery
Delivery methods	Which tools and delivery methods are involved in this delivery service?	IDs of tools to be used
Workflow	What should be done to this delivery service next? By whom?	Allocation to delivery team members, Responsible person, Realized date and time of delivery
History	What has been done to this delivery artifact? When?	Information about all prior edits, editors, and changes

The *delivery methods* class is used to provide traceability links to the tools and methods involved in the delivery services.

Workflow describes who is responsible for delivery processes and the realized time of delivery. If there is a breakdown, *Workflow* documents the workarounds that should be taken to provide the delivery and the responsible stakeholders. The delivery management team needs to communicate with the requirements management team and form a reasonable solution for the breakdown.

4.3. Validating and scoping the design product theory for the class of RDMS

According to the representatives of the case companies, the design product theories for the classes of RTDMS and OTWMS incorporate the designs of the eSourcing life-cycle processes and information systems that have helped the companies to transcend the limitations of the mediated eSourcing business model. As a result, they have gained projects that are more profitable and established direct communication with the end clients. The databases support, respectively, the associated RTDMS and OTWMS instances and accumulate the knowledge and lessons learnt, helping the case companies to enhance their service capabilities.

Specifically, an RTDMS instance aligns test requirements and related test cases and defects, helping test teams to monitor service progress and to locate defects efficiently. The RTDMS instance sends real time defect information to testers and clients, so all the involved stakeholders can communicate with each other as necessary, thus making the testing process transparent and seamless. Before Ltesting used a RTDMS instance, test teams needed to collect the defects and send them to clients in regular batches, creating unnecessary delays. Clients had to repair defects without sufficient background information. For example, clients did not necessarily know the relationships of defects to test requirements, the times when test teams had run particular test cases, and the order of test case execution. Therefore, the availability of defect information and aligned requirements and test cases reduce the costs incurred by providers and clients during the eSourcing life-cycle.

The databases have offered Ltesting defect information from previous similar projects and helped clients to repair defects quickly, impelling clients to outsource larger, longer-term, and more profitable projects to Ltesting. Ltesting has established strategic relationships with clients.

The HP Quality Center (QC), a commercially available integrated requirements, test and defect management product, served as the RTDMS instance in the case company. It required clear access rights for the different roles involved, causing some trouble for Ltesting in the early stages of adopting RTDMS. Depending on the project characteristics and the financial pressure, test analysts and test managers may have to do testers' work. RTDMS has impelled Ltesting to improve its organizational structure and, specifically, test team structure. Ltesting has established independent quality assurance teams and configuration management teams, facilitating the

provisioning of more comprehensive and professional services.

"All the test projects use QC or other similar test platforms, but the other platforms mainly focus on test management. QC is the best because it can also offer complete requirements management and defect management services. The specific test tools can run on this platform, but they can also run on other platforms, so based on QC we can better control the entire service life-cycle." -CEO

"QC is a good example of an RTDMS. We rely on it to improve our performance, communication, and service effectiveness. Clients are satisfied with our service quality and want to give better contracts to us, which means larger and more profitable projects." -CEO

PGL has developed an OTWMS instance for executing transparent logistics services. When an order is generated, the OTWMS provides the transportation team and the warehouse management team with the order information in real time, so they can prepare for service delivery. Clients can get all the information they need whenever they need it based on the order number. For example, they can track cargo information easily. The OTWMS has thus helped PGL to gain clients' trust.

"Without the help of the OTWMS, it would be impossible to deal with breakdowns in one hour. This system enables us to communicate with all stakeholders including clients in real time, which is crucial to deal with breakdowns effectively." - An order manager

"The timely information enhances our transportation and warehouse management effectiveness, helping us to improve performance. The OTWMS helps to make the life-cycle transparent and seamless, so we can earn clients' trust and establish strategic relationships with them." -CIO

The design product theories for the classes of RTDMS and OTWMS contribute in their respective domains and thus help the case companies to transcend the limitations imposed by the mediated outsourcing business model. The abstract class of integrated Requirements and Delivery Management Systems is based on and partly validated by RTDMS and OTWMS instances, so it can be expected to facilitate small and medium-sized eSourcing service providers in overcoming the limitations imposed by the mediated outsourcing business model.

5. Conclusions and future research

The research project provides several contributions. The design product theories for the classes of RTDMS and OTWMS contribute in their respective

domains. The third main contribution is the design product theory for the abstract class of requirements and delivery management systems. This theory is partly derived (1) deductively from comprehensive kernel theories such as eSCM-SP and (2) inductively from the domain specific design product theories for the classes of RTDMS and OTWMS. The theory prescribes an abstract class of systems because instances of the class need not be built. The theory is primarily used to create more detailed domain-specific design product theories. The design product theories for the classes of OTWMS and RTDMS are such domain-specific theories used to prescribe information system subclasses of the class prescribed by the design product theory for the class of RDMS. The theory is expected to help eSourcing service providers and commercial software vendors to design domain-specific integrated systems for service provisioning and breakdown recovery throughout the eSourcing life-cycle in a variety of ICT and business process sourcing domains, helping clients and providers to manage and control the eSourcing life-cycle and to make the process transparent and seamless.

The project will continue the validation of the design product theory for the class of RDMS by making the theory bidirectionally traceable with the design product theories for the classes of OTWMS and RTDMS that specialize the abstract class for the subclasses in their specific domains. Future research is needed to use the design product theory to build a set of other domain-specific design product theories and to trace the theories back to the design product theory in order to further validate and revise it.

6. References

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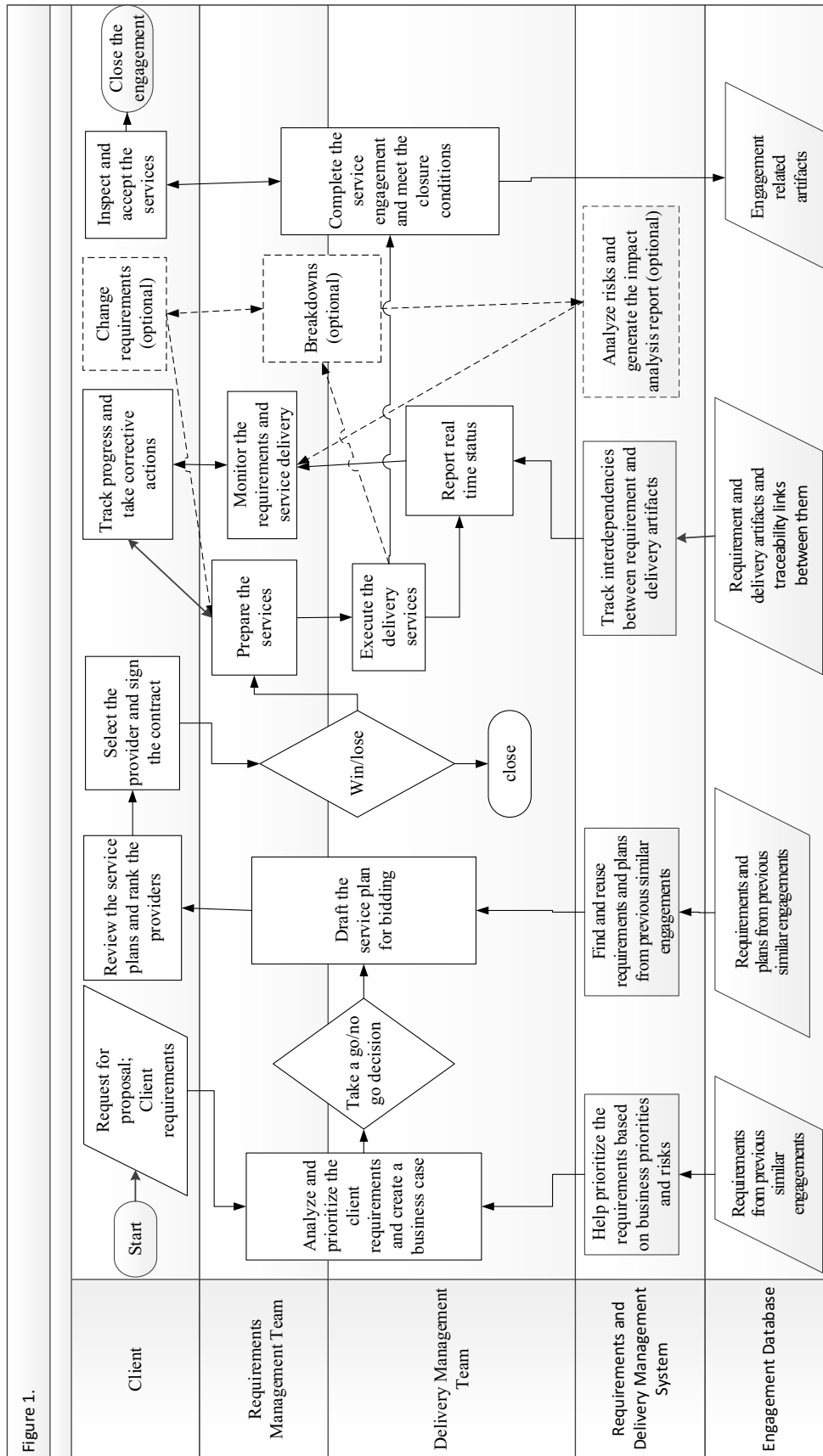


Figure 1. A meta-design for the class of integrated Requirements and Delivery Management Systems supporting the eSourcing life-cycle