Business Process Management Systems – enabling continuous improvement in industrial services

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Abstract. The paper aims to analyze the opportunities that modern business process management systems (BPMS) provide in improving industrial service processes. A case study identifies improvement opportunities in the order-to-cash process in two service lines of a large industrial service provider. Implementing a business process management system in the studied case context potentially enhances service process quality and significantly speeds up the order-to-cash process. The practical implication is that providers of industrial services should consider BPMS as a potential means to improve profitability through a faster order-to-cash process.

Keywords: Industrial services, order-to-cash, BPM

1 Introduction

The aim of this paper is to analyze opportunities that modern Business Process Management Systems (BPMS) provide for managing industrial service business processes. Good results have been achieved with BPMS implementations, especially in back office dominated service industries like for instance banking and insurance [1,2]. However, applying it in industrial services is largely unexplored. In the last few years BPMS have improved to a level that potentially facilitates smooth process modifications, coordination and tracking of geographically dispersed process instances as well as monitoring process progress and analyzing process performance. The research problem is that BPMS could perhaps be exploited in managing complex and fast changing industrial service processes, but this proposition has not been tested in practice, nor have results been document and presented in academic literature.

2 Literature review

Process management is a structured approach to design, execute and analyze a company's business processes for improved performance [3]. Its adaption has become common in the past few decades as business leaders realized that the traditional function based management structure easily leads to sub optimization in which the cost of coordinating the whole company is above the cost savings gained from different functional areas [4]. Hence, the idea of process management is to strengthen the company by getting rid of fragmented functional management and focusing on work and information flows that cut across different functions and eventually deliver value for customers [5]. The objective is to integrate processes from end-to-end.

Industrial services are services, offered by manufacturing companies to organizational customers. They require competences, information, equipment and tools to create value for the customer [6], [7], [8]. It has been noted that transaction-oriented traditional ERPs, designed for stable businesses processes, have problems in supporting complex industrial services business processes [9], [10], [11]. Service oriented firms need to compete through use of knowledge to gain agility in altering processes quickly based on customer needs as well as to provide adequate visibility and control of ongoing processes [12]. Therefore a management mechanism that supports fast and flexible, but still controlled business process management is needed [13].

The development of business process management systems relates closely to Workflow Management (WfM), i.e. the automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules [14]. A critical milestone was the foundation of Workflow management coalition (WfMC) in 1993, when companies, who realized the need, started the development of standards in order to enable different workflow products, i.e. contemporary IT systems, and applications to communicate and work together [15]. The key development step was the separation of the management and execution function of a workflow. This enabled dynamic re-designing or adjustment of business processes separated from the execution environment. In other words, the entire business process could be revised and modified on the fly without disturbing the process components or the cases in progress. [16], [17], [18]

Over time system vendors started to talk about business process management systems (BPMS) instead of WfMS, e.g. [13], [19]. The reason was that workflow management referred too much to re-design and automated coordination and execution of intra-organizational business processes. The main ancillary feature in a BPMS compared to the earlier WFMS is the capability to analyze potential targets for development of cross-organizational business processes using detailed level operational process data. Current BPMS are generally web-enabled, meaning that parts of processes can be exchanged as web-services, in which the service provider accounts for fulfilling a certain process and providing required information for the service recipient. BPMS are also capable of maintaining larger repositories of hierarchical processes, managing quick process modifications as well as handling flexibly special cases, providing a potential mechanism for managing cross-organizational service business processes. [20], [21], [22], [23]

The generally stated benefits achieved by implementing a BPMS businesses processes include enhanced process efficiency and control through automated workflow coordination, improved process quality and customer service, increased agility and responsiveness through ability to modify process models flexibly, better process visibility and overall process understanding, consistent means for monitoring, analyzing and redesigning business processes, smooth integration of BPMS with legacy and new systems. [2], [4], [13], [15], [17], [20], [24, [25, [26, [27]

3 Methodology and research process

The empirical research was carried out as a qualitative case study in co-operation with a large, manufacturing company that increasingly is in the industrial service business. The case-company had faced serious problems in managing service deliveries with a highly networked service supply chain, which had become evident by very slow capital turnover. To improve its order-to-cash process management, the company started a pilot project in which it implemented a workflow management system to manage the order-to-cash process. The purpose of the case study was to examine the challenges faced by the case-company in managing its order-to-cash process in service business and to evaluate the potential of a more advanced BPMS to achieve improvement.

Data collection on existing challenges in the order-to-cash process and potential impacts of introducing BPMS was gathered with open interviews. A questionnaire form was used as a guideline, but the interviewees were able to bring out issues they considered important. The focus was kept on the current order-to-cash processes in two different service lines, i.e. installation and maintenance services, covering commonly faced problems and development needs. Each session lasted about one and half hours and they were held mostly face to face, though in some cases telephone interviews were held due to long distances. All interviews were recorded and notes were taken during each session. Afterwards the interviews were replayed to ensure that all relevant points were noted. The notes summarizing the interviews were sent back to the interviewees so that they could make corrections and additions if needed. This way the risk of misunderstanding in data collection was decreased. In addition to the interviews, internal company documents and workshops served as an important source of information.

3 Case study - Service order-to-cash process development in a industrial services providing company

The case study focused on the order-to-cash process of two separate service business lines, i.e. installation and maintenance. Installation delivers service solutions ranging from pure equipment and software implementation to turnkey solutions that include planning of equipment and services, site acquisition, construction works, equipment deliveries, installing, integrating and commissioning.

Regardless of scope, the installation service process is a phased, small scale construction project which is executed up to thousands of times depending on the size of the customer project. The scale and content of the service offering depends on the customer, but the case company is typically responsible for coordinating the whole process, i.e. synchronizing the service supply chain including several different parties, e.g. customer, customer's partners, own material and service suppliers. Maintenance services is an ongoing process including reactive and proactive services responsible for keeping the installed base operating and ensuring the agreed service level specified with the customer. Maintenance service deliveries also involve people, parts and equipment from a networked service supply chain constituting of internal and external parties. In many cases a solution offered to a customer includes services from both service business lines in which case the service responsibility is transferred gradually from installation to maintenance.

The structure of the order-to-cash process depends on the customer case. In turnkey solutions the order-to-cash process starts already in the tendering phase, as the case company participates in network planning and suggests a suitable service package per individual site (Figure 1). The customer may accept or modify the suggested product and service modules, before actual ordering. Several iteration rounds may occur. In more simple installation cases the customer simply orders predefined services.

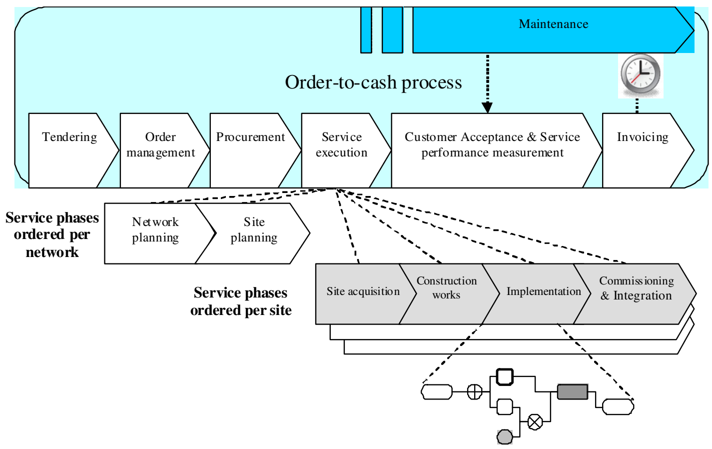

Fig. 1. Order-to-cash process structure depends on the service solution content. Some services are ordered per network and others per site. Installation order-to-cash is transaction based whereas Maintenance order to cash is triggered periodically.

The invoicing in installation services is always transaction based, though billing milestones differ subject to project and customer. Thus the order-to-cash process performance is strongly tied up with service supply chain performance and the service process flow across different functions. The more efficient and higher quality the service process, the smoother the execution of the order-to-cash process and the faster the revenues are collected. In maintenance, invoicing is made periodically. The order-to-cash process is initiated at the time when the service contract is made and triggered according to an agreed billing plan throughout the validity of the contract. Timely contract updates, good tracking of changes in the installed base and delivered services is required to be able to ensure cost efficient service deliveries and cash flow.

4.1 Challenges in the existing service order-to-cash process

Challenges in the studied order-to-cash process management and execution relate to end-to-end process understanding and visibility, information sharing, coordination and control, flexibility as well as IT infrastructure. The net business impact is seen as slow capital turnover and high operating costs.

First, the overall understanding of the cross-functional order-to-crash process is considered inadequate. In an example project the network planners had a wrong picture of the possibilities to make changes in the service configurations during the order-to-cash process. They did not understand the overall process and how their actions affected upcoming process steps [28]. Although process flowcharts and written instructions were available, having them in Corporate Intranet is not enough to ensure sufficient understanding and motivation to follow the process.

Another major challenge is coordination and communication between front- and back-end. The involvement of multiple external resources does not ease the situation. The main problem is that coordination is currently managed fairly ad hoc and people have to use, in-flexible IT-systems, e-mail with ad hoc spreadsheets and phone calls in each service case to get the needed information. This decreases data accuracy and the perceived state of the process is often wrong.

Third, process control was considered inadequate. For example, in installation order-to-cash it is formally required that sales- and purchase orders are entered into the ERP system for each site- and implementation phase. The objective is to decrease late changes in service orders and to enable invoicing whenever a billing milestone for an individual site has been reached. However, sometimes orders are placed for a group of sites and for various phases collectively. In this case, it is more likely that the service scope for the upcoming service phases changes which incurs costs of reversing the orders. Furthermore, if orders are taken for multiple sites simultaneously, receivables can be collected only after the last service process at the last site is accepted by the customer.

The IT systems in use were not capable of handling process modifications of individual order-to-cash process instances. The missing flexibility encourages people to work ad hoc, which again complicates monitoring and management of the order-to-cash process as a whole. In milestone based invoicing, the problem with inflexibility results in costs related to reversed transactions, delayed service deliveries and accumulated workload. In periodical billing unexpected process changes create costs related to excess capacity or alternatively costs related to not hitting the agreed service level.

Finally, a challenge faced by the case company relates to process tracking and performance measurement. The case company lacks detailed and accurate tracking of order-to-cash process data, which could be systematically analyzed to support decision making at all organizational levels. For instance information to answer the following questions was found lacking: What service offerings were ordered by the customer and sold by the company?; What services and equipment were planned to be delivered and on what schedule?; What services and equipment were actually delivered, where and by whom?; How long did each activity last and what did it cost?

All in all, difficulty in service process re-design, poor process coordination as well as inadequate monitoring and analysis capabilities currently hinders a continuous service order-to-cash process development, as illustrated by figure 2.

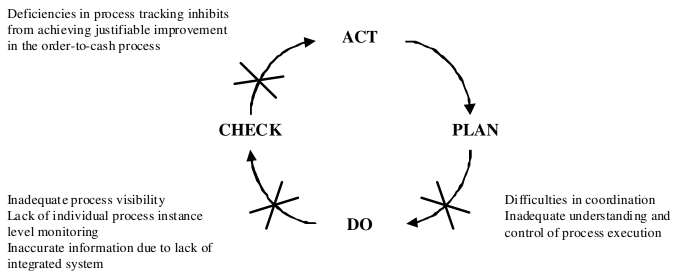

Fig. 2. Order Continuous order-to-cash process improvement in installation and maintenance was hindered due to the lack of feedback between process planning, execution, monitoring and analysis.

4.2 Overcoming the challenges with the support of BPMS

The challenges described above were tackled successfully in a large network project in the case company. The project comprised the installation service of over 20 000 sites. An improvement initiative was launched aiming to improve the order-to-cash cycle during the project. A key enabler was the adaption of a primitive WfMS called Flexible Order Management tool (FOM). FOM provided customers a web-interface to make service requests per site, which triggered each time the initiation of a new order-to-cash process instance. It automatically coordinated the work of geographically dispersed resources, requested for approvals when needed, informed about pending tasks for different resources in different locations, and at the same time collected important data about each individual process instance for monitoring and analysis purposes. Process status could be updated by simply clicking visually presented process steps online. Some service steps were recognized automatically, since the installed equipment and parts can communicate over a wireless network. The workflow included remote monitoring of what new parts or software was installed at specific sites. The relevant data for the remote monitoring process was collected in an installed base data warehouse and translated by FOM to produce reports on the order-to-cash status and performance of installation work. FOM also cross-checked ordered, installed and invoiced services automatically from other relevant systems and ensured communication related to invoicing with the customer's financial system.

Although a rather simple workflow-tool, it provided a controllable and traceable process for customer interaction: no uncontrolled order changes could take place and reliable measures on delivery lead times could be provided. The tool provided needed flexibility to adjust the order-to-cash process for individual service sites but also provided the desired level of control in execution. It also introduced clear process milestones and brought the real-time status of each individual order-to-cash process instance visible via web for responsible people. This improved process understanding and facilitated the monitoring and management of the whole service supply chain in a cost efficient way. The improvement in process quality, efficiency and responsiveness achieved was a 45% reduction in receivables cycle time, over 90% reduction in number of inaccurately filled orders and over 75% reduction in the service delivery cycle time. (for more details see [28])

The implemented tool described in the case study was designed to support the management of thousands of dispersed industrial service deliveries in a huge customer project. It was a pilot version of a workflow tool with only selected functionalities that could be rapidly introduced to resolve specific problems faced by the case company in an individual large project. Introducing more comprehensive and up to date business process management systems (BPMS) described in this paper could bring at least the same improvements and provide a means for managing industrial service processes in general.

5 Conclusions

The study shows how high variability and the requirement for responsiveness in industrial services is a challenge for the order-to-cash process management. Customer inputs might change during the service process execution, which means that changes must be managed in a controlled manner. Service processes involve typically geographically dispersed stationary as well as mobile, internal and external, human and application resources that need to be coordinated efficiently. Flexibility and agility are needed to modify and improve processes quickly to meet changing circumstances. In addition, there must be a way to trace and monitor individual service process instances and to analyze the impact of any changes on process performance. Without adequate instance level monitoring it is hard to achieve improvement in a business environment, where customer requirements and service processes change.

BPMS provide a mechanism for tracking service process instances individually and using this information first to analyze business process performance efficiently on different organizational levels but also to flexibly re-engineer and adopt processes to meet the changing service business environment. That is, they ensure feedback between enacting, monitoring, analyzing and redesigning industrial service processes facilitating continuous improvement.

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