Available online at www.sciencedirect.com

ScienceDirect

Procedia CIRP 57 (2016) 79 – 84

www.elsevier.com/locate/procedia

49th CIRP Conference on Manufacturing Systems (CIRP-CMS 2016)

A Meta-Model for Analyzing the Influence of Production-Related Business Processes

Christopher Lock[a]*, Gunther Reinhart[a]

[a]*Institute for Machine Tools and Industrial Management (iwb), Technical University of Munich, Boltzmannstraße 15, 85748 Garching, Germany*

* Corresponding author. Tel.: +49-(0)89-289-15495 ; fax: +49-(0)89-289-15555. *E-mail address:* christopher.lock@iwb.tum.de

Abstract

The improvement of business processes is viewed as a key to competitive success. Since the beginning of the 1990s, many companies could increase their efficiency through initiatives improving the production process. Despite the existence of numerous different scientific approaches to improve the supporting processes of indirect business areas, comparable successes could not be achieved. In the literature for business process management, the described guidelines and methods for process prioritization are often of very high level and hence not of much assistance when attempting to use them on production-related business processes. Further approaches focus the modelling and analyzing of single processes. These are often very detailed and do not taking into account the interrelations and influences that arise between the processes. An analysis and comparative evaluation of the production-related business processes of indirect areas does not exist. This paper presents an approach to analyze the influence of supporting business processes on the goals of their core process. Therefore, a meta-model is introduced to describe different types of interrelations between processes within in a process system by specific characteristics. The considered system includes the manufacturing process and its support processes as the interrelating elements. Based on the meta-model, influencing factors of the support processes on the characteristic values of the manufacturing process are determined. The paper contributes to theories on business process architecture and the modeling of process systems as well as the basics on system theory. In the literature review of this paper, different approaches for the selection of critical processes, the modelling of process systems and the interdependencies between processes are discussed.

Peer-review under responsibility of the scientific committee of the 49th CIRP Conference on Manufacturing Systems

Keywords: business process prioritization; process systems modeling; process architecture; process interdependencies

1. Introduction

As part of the progressive digitalization holistic approaches for industrial processes, business models, services and labor organizations taking an increasingly important role [1]. The associated increase in complexity requires a paradigm shift. Operating point-optimized, corporate value chains have to be converted into flexible enterprise-wide value networks. Problem-specific IT solutions have to be replaced by an integrated production and supply chain management, and the focus of the function optimization has to be consummated towards more process orientation [2]. Particularly manufacturing companies face the challenges of dealing with extended and constantly changing value chains [3]. At least since the beginning of the internationalization of markets and the consequential cost pressure everything is given to optimize production processes and increase the added value in business processes [4]. During the last decades, the productivity of production processes could be increased significantly through continuous improvement by avoiding waste and consistent focus on the value added [5]. In indirect business areas (supporting departments, e.g. planning, development, administration, etc.) such increases in productivity could not be achieved [6]. A study of the Institute for Machine Tools and Industrial Management (*iwb*) of the Technical University of Munich, which focused the dissemination of lean principles

Peer-review under responsibility of the scientific committee of the 49th CIRP Conference on Manufacturing Systems
doi:10.1016/j.procir.2016.11.015

and methods in indirect business areas, shows that these parts of the value chain, have major potentials for rationalization and improvement [7]. Over time, many approaches to improve business processes in indirect business areas have been developed. These focus mainly on extensive analysis to determine the performance of individual business processes and redesign them to achieve lower costs and improve quality [8]. Against the background of limited resources and a continued strong functional orientation in the indirect business areas it often comes to a local optimization of processes, which in many cases does not yield the desired success [9]. Few approaches grappled with identifying those processes that are truly important for value creation. As in manufacturing processes, companies are forced to analyze the business processes in the indirect areas in terms of added value [10]. This begs the question which processes are important for value creation and therefore which processes should be improved or supported [8; 11; 12] to secure a long-term corporate success. Because of the insufficient transparency in their process landscape, many companies struggle to make profound decisions about what processes make a contribution to value creation. This is mainly because the causal relationships between the supporting processes and the actual value creation process are not sufficiently known. Furthermore there are no benchmarks that would allow a comparative assessment of the different processes.

Starting from a brief literature review of process prioritization methods and the modeling of process systems, this paper presents an approach for analyzing the influence of supporting business processes on the goals of their core process. Therefore, a meta-model is introduced to describe different types of interrelations between processes within a process system by specific characteristics.

2. Literature review

2.1. Goals for improvement of business processes

In recent years, the improvement of business processes in indirect business areas was broadly investigated. Two different paths are followed substantially. The concept of Business Process Reengineering requires a radical redesign of business processes [13]. The focus is mainly on the identification and design of new and ideal processes, [14]. The other concepts pursue a continuous improvement approach. Here, existing processes will be further developed with regard to certain outcomes.

The literature about process improvement focus mostly on the increase of efficiency [15]. For this, single processes are analyzed and evaluated in terms of different performance parameters [14]. The different approaches in this field of research provide performance parameters like process quality or quality of results [16], process costs [17], but also the productivity [18], cycle time, delivery dates and waste or value of a processes [5; 7; 8].

The aim of most approaches is to identify the weaknesses that lead to a reduction of the performance parameters and take the adequate measures. However, the mentioned approaches only consider single main processes of a company. Supporting processes and their impact on the performance of the main process are not considered.

2.2. Prioritization of business processes

Due to limited resources, some of the existing approaches on process improvement state to make a selection of processes before starting the improvement initiatives [12; 19]. Therefore, we can find different selection criteria in literature. Besides the importance [20] of a process, Davenport names the urgency and conflict potential with the business vision as selection criteria [20]. Additionally to the importance of a process, Hammer & Champy suggest a focus on the most deficient processes on the one hand and the processes with the highest susceptibility to improvement measures on the other hand [13].
Recent approaches try to operationalize the evaluation of different criteria and integrate the findings into guidelines for practitioners. Ohlsson et al. e.g. describe a tool to analyse processes from different perspectives. Besides the alignment of the process with the business strategy, the process performance, the measurability, the formality and the availability of capabilities for process improvements also the degree to which a process interacts in a value network are regarded [9]. The interaction of processes arises among others in case of failure of a process that effects the organization or has an impact on organizational goals. Huxley presents these criteria in course of the development of a method for identifying critical business process [21], however, without specifying the dependencies.

The considered approaches show that there are different opportunities and criteria for selecting processes. However there is still no approach that takes into account the influences between processes within a focused process system.

2.3. Process system modelling

Similar to the company also the process landscape of a company can be considered as a system [22]. The interrelations and predominant causal chains within the system are manifold and difficult to comprehend [14].
To provide an overview of all the processes of an organization (core, support and management processes) and to visualize the relationships between them, so-called process maps are used [23]. Malinova & Mendling have shown that the correct design of process map can contribute to achieve the objectives of business process management, such as increasing the transparency as well as the efficiency of processes [24].
For optimizing business processes within a process system a high level view on their interdependencies is necessary [11]. Approaches within the field of Business Process Architecture are dealing with designing, structuring, managing and maintaining large process model collections [25 - 29].
Other approaches only focus on the formalizing of inter-process relationships in order to establish inter-process relationships in a process repository [30] or integrate existing information systems [31]. However, none of the approaches described is focusing on the specification of the relationships