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Customer Information Usage: Improving Supply Chain Performance and Advancing Logistics Services in Construction Projects

CUSTOMER INFORMATION USAGE: IMPROVING SUPPLY CHAIN PERFORMANCE AND ADVANCING LOGISTICS SERVICES IN CONSTRUCTION PROJECTS

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ABSTRACT

This study investigates how continuous improvement of logistics services in a project- based context such as construction can be enhanced by a "priority matrix for service improvements". Construction services in general, and logistic services in specific, have great impact on efficiency and sustainability (environmental as well as social). Solutions and experience from e.g. manufacturing and retailing that have undergone major transformation through industrialization and, more recently, servitization, to improve the quality and novelty of their offerings, there is a great potential in addressing the complex coordination, inefficient processes, and waste of materials in the project-based context of the construction industry. Whilst improvement initiatives concerning product quality are important inspiration of such transformation, they are based on continuous production processes and become a challenge when this experience is transferred to the project-based, construction industry. As response, this study draws upon the concept of service quality as the basis for improvement initiatives – a concept based on relations between actors that last beyond individual projects.

Keywords: Customer information usage; construction projects; logistics services

1. INTRODUCTION

In construction, the products (i.e. buildings) are physically big and immobile, and thus produced on the site of use. Construction projects are organized in a multi-actor setting, where each new project generates a new set of supply chain actors. As much as 60-80 % of the gross work involve materials and services purchased from suppliers and subcontractors (Scholman, 1997). The function of construction logistics is to coordinate the flows of material, personnel and machinery among these actors, thereby the logistics services influences the performance of individual actors such as sub-contractors as well as the total costs of the construction itself. However, one key source of inefficiencies and waste in construction is the lack of such logistics coordination amongst the various actors. There are two key challenges behind this; the lack of a natural logistics coordination orchestrator and to create continuity of improvements and level of achievement beyond discrete projects. By building upon the notion of customer- driven improvement efforts, this study examines through a multiple case study the usage of customer information in both improving supply chain performance at a project level and advancing of logistics services so that experience and good practices are carried from one construction project to the other. The customer information perspective allows to examine

the opportunities of new actors in the construction supply chain, i.e. merchants and third-party logistics providers, taking the role of logistics coordination orchestrators and enabling a knowledge continuum project to project.

1.1 Problem definition and purpose

Increasing urbanization refers to more people and more economic activity taking place in cities, resulting in increased construction activity for housing and commercial property as well as infrastructure to support movement of goods and people (Lindholm, 2010; Savelsbergh & Van Woensel, 2016). Construction projects produce the end product (houses or infrastructure) at the point of consumption (Ekeskär & Rudberg, 2016), where a multitude of materials and resources need to be delivered to, and removed from, each site (Josephson & Saukkoriipi, 2007; Lindén & Josephson, 2013). As result, additional transport flows are created, competing for the existing infrastructure with other traffic users in highly populated areas. However, the construction industry have long suffered from lagging productivity in relation to other industries (McKinsey & Company, 2017), and Josephson and Saukkoriipi (2007) report that an average Swedish construction worker spend over 50% of their time on waiting and material handling. Reports from the UK indicate a similar situation (Latham, 1994, Egan, 1998, Department for Business Innovation & Skills, 2013). The lack of proper logistics management is one of the main reasons for these inefficiencies. Hence, there is an urgent need for improved efficiency to be able to meet the increasing requirements on logistics services with the resources available – i.e. producing high volumes of outputs of good and at affordable quality.

Despite the need to improve the logistics services, the opportunities to improve both productivity and service quality are often lost as learning and experiences are not effectively taken care at the completion of the project (Dubois & Gadde, 2002). Interestingly, however, relationships between actors are more permanent than the particular project and have thus a great potential for creating conditions for a joint service quality improvement based on prior experience and carry these into upcoming projects.

The overall aim of this research is to contribute to quality improvement of construction services in general, and construction logistic services in specific. The purpose of this paper is to develop a proposition for further research.

The focus is on construction logistics services from a quality management perspective.

2. METHOD

The research design builds upon the principles of engaged scholarship (van de Ven, 2007) where the research team and practitioners co-create new knowledge. A case study design using interviews and secondary evidence will be used to achieve closeness to and in-depth understanding of the phenomenon studied. The collaborative part of the study will be operationalized through concept mapping (Trochim, 1989; MacLinden, 2017) bringing out diversity of viewpoints from different actors in group meetings and workshops (Bäckstrand & Engström, 2019). Through this participatory process, multiple stakeholders (practitioners) take active part in collecting and analyzing the data (brainstorming, identifying relevant items, sorting these and then rating relative to importance and feasibility, respectively). Based on cluster analysis of this evidence, participants take part in interpreting results and building a tool usable for them.

3. TEORETICAL BACKGROUND

A better understanding is needed of the situation where a construction project is brought to completion, but where the relationship between actors remain, providing an opportunity to preserve and advance further results of improvement effort for the next/upcoming construction. This paper builds upon the integration of three different fields;

Quality management brings in principles of continuous improvement and service quality,

which have been developed through experience of e.g. the manufacturing industry.

Construction logistics and supply chain management, aiming to add a strategic perspective on logistics services in construction in contrast to the existing operational perspective.

Service marketing focus on value that is co-created in the service exchange process between a provider and a customer and brings in experience from companies and industries that have transformed their value propositions through servitization.

Accordingly, construction services, including logistics, are approached from a service rather than cost perspective; focus is less on transactions and costs and more on relationships and value. This also points to the criticality of identifying relevant actors and starting to identify improvement responsibilities among them.

3.1 Quality management

Improving efficiency as well as customer satisfaction is central in many industries, with the manufacturing industry often seen as a forerunner with Lean initiatives, large-scale quality improvement programs, and established quality management systems in place. Well-defined and continuous processes are the core of improvement initiatives in manufacturing; here the construction industry with its project-based organization differs from more flow-oriented industries that have undergone major transformation through industrialization (Sousa & Voss, 2002). The learning between manufacturing and construction is somewhat limited and continuous improvement initiatives seen as challenging in the construction industry (Backlund & Sundqvist, 2018).

The potential for improvements of the construction industry performance through the use of supply chain management (SCM) and logistics management have been highlighted by several authors throughout the years (Agapiou et al, 1998, Akintoye et al, 2000, Vrijhoef & Koskela, 2000, Sundquist et al, 2018). However, several studies reports difficulties in implementing improvements (Dubois & Gadde, 2002, Bankvall et al, 2010, Cheng et al, 2010). Amongst the reasons for this are the fragmented and temporary nature of construction projects, the continuously changing construction network in terms of team and involved parties, conflicts of interest between owner and project manager, lack of knowledge transfer from one project to another and reliance on old ways in the construction industry (Jensen, 2017). These characteristics of the industry makes it difficult to set up information channels to exchange data and knowledge (Titus & Bröchner, 2005). Furthermore, for any type of construction logistics solution there are multiple benefits, however these are unevenly spread among the actors (Janné & Fredriksson, 2019), making some actors unwilling to implement and improve new logistics solutions.

3.2 Construction logistics

Construction logistics research is generated from two problem areas with different perspectives (Fredriksson et al, forthcoming):

1. The need to improve efficiency of the construction production, generally taking the perspective of the developer or main contractor;
2. City logistics, taking the perspective of the municipality and its need to control the construction traffic.

Within the first area, construction logistics focus both on coordinating the fragmented sourcing of materials and resources to and from the construction site, as well as coordinating materials and resources on the construction site itself (Thunberg, 2016). Construction supply chains and the related logistics services are associated with large quantities of waste and other problems that are often caused in another part of the supply chain than where the problem is detected (Vrijhoef & Koskela, 2000).

Recent research focuses on different types of construction logistics solutions (CLS) (Janné & Fredriksson, 2019). A CLS is made up of different elements, which together determine the types of

services that can be offered (Sundqvist et al, 2018). There are complex setups consisting of several elements serving large scale development projects as well as small setups serving just a single site (Fredriksson et al, forthcoming). This has been studied from the perspective of logistics service providers (Fredriksson et al, forthcoming; Sundqvist et al, 2018). A CLS provider works as a system coordinator in construction project, orchestrating the service use between different involved actors and coordinating material, waste and resource flow to, from and on the construction site. The orchestration of these flows has previously been studied from a supply chain management perspective with a focus on planning (e.g. Thunberg & Fredriksson, 2018; Bäckstrand & Fredriksson, 2019). Further, to make the orchestration of the CLS take place there is a need of governance mechanisms which previously have been studied from a city logistics perspective (Janné & Fredriksson, 2019; Lundesjö, 2011, Janné et al, 2019).

The second area focuses on reducing disturbances on the surrounding society and to improve the coordination of construction traffic (Dubois et al, 2019, Janné & Fredriksson, 2019) and is not in focus in this paper.

3.3 Service marketing

The potential of SCM and logistics management in any industry is not possible to release without a similar transformation of the service network of which it depends on (Gebauer et al, 2013). Today, improvement initiatives in manufacturing have changed alongside with increased servitization and the increased portion of services offered to customers. This has led to significant developments in service quality where the customers "do not determine quality based on the final outcome of the service process only, but that quality is perceived and accumulating throughout the [value-creating] process" (Grönroos, 2011, p. 295). Here, service quality improvements are based on relations and interactions between actors rather than on transactions and output (Gremyr et al, 2017). In a project-based organization, relations between actors are what remains after the completion of a project, and to gain and retain continuity, service quality improvement initiatives are arguably relevant to learn from (Halldórsson & Vural, 2019). As results of increased focus on logistics and management of the whole supply chain in the construction industry, third party logistics service providers (TPL's) are now establishing themselves as part of the construction supply chain. However, in order to provide services to the construction supply chain the TPLs need to adapt their service offerings to the context of the construction industry (Gosling et al, 2015).

4. RESULTS

The three parts -- elements, orchestration and governance mechanisms – constitute the conceptual cornerstones of the project and are illustrated in Figure 1.

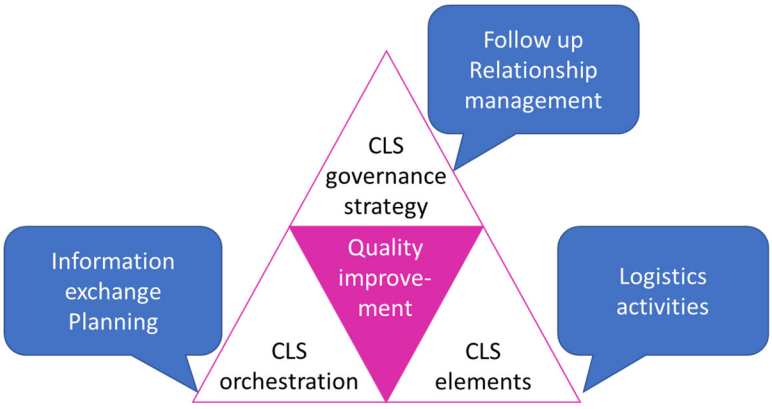

Figure 1. The construction logistics solution (CLS) triangle

Currently, CLS's is still a rather unused approach (Langley, 2015; Janné, 2018) and there is a lack of processes taking a holistic perspective, i.e. all three parts and how to improve the CLSs as a whole. Furthermore, the many actors involved in construction projects have different goals with a CLS, which complicates the process of making these decisions (Janné & Fredriksson, 2019). To achieve an improvement within this area a Quality Management (QM) perspective is needed, argued to be a potentially useful perspective to enhance quality and efficiency (Backlund & Sundqvist, 2018), as well as sustainability (Siva et al, 2016). Research on QM in the construction industry has focused on e.g. certain improvement initiatives such as Lean construction (da C.L. Alves et al, 2012) and mechanisms affecting that implementation of these initiatives (Bygballe et al, 2018), or on ISO 9001 in construction (Landin, 2000).

Facing the challenges in learning from process-based improvement initiatives e.g. in manufacturing, it has been argued that "the construction industry needs to blend quality concepts from both the service and manufacturing industries" (Landin, 2000, p. 509). Hence, manufacturing firms that have undergone servitization and offer both products and services as bundles (Nordin & Kowalkowski, 2010; Gremyr et al, 2010) are a viable benchmark. Services concerns value and customer needs rather than costs, and their quality is inherently relational and based on interaction (Woo & Ennew, 2005). The relations in which services are taking place and their quality is co-created, remains in between projects and can be the continuity to base improvements on.

4.1 Proposition

This paper contributes to current knowledge by exploring the applicability of logistics service quality in the construction industry, overcoming some of the conflicts inherent between traditional product quality initiatives (assuming underlying processes) and a project-based context. The proposition for future research is to develop a typology of logistics services at a construction site; a typology used as a basis for a priority matrix supporting decisions on what logistic services to prioritize for improvement efforts in relation to potential impact on efficiency and sustainability and in terms of actor responsibility. The priority matrix should also contribute to an understanding of possible trade-offs between cost, quality and sustainability of logistics services.

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