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Ahmet ANIL SEZER (2016), *Construction performance measurement: Site managers in refurbishment projects*, PhD Thesis, Department of Technology Management and Economics, Chalmers University of Technology, Gothenburg (Sweden), 16 November 2016.

Main supervisor: Jan BRÖCHNER, Professor, Chalmers University of Technology. Co-supervisors: Henrik ERIKSSON, Associate Professor, Chalmers University of Technology; Holger WALLBAUM, Professor, Chalmers University of Technology

Large project-based organizations are decentralized structures. Decentralization allows local managers to respond to various project and client requirements, but makes it difficult to align local managers' activities with organizational goals and strategies. Therefore, firms use management accounting and performance measurement to monitor and manage their local managers.

In general, there are challenges when measuring construction performance. On the industry level, according to the EU KLEMS database, the construction industry productivity growth rate is low and productivity growth patterns resemble those of business services. Previous studies explain low construction productivity growth rates only in the short term, referring to factors such as decline in average age of workers and increased capital per worker. More fundamentally, there are two alternative explanations for low productivity growth rates: (i) the industry and its boundaries are not clearly defined and (ii) mismeasurement of productivity. Relying on the services productivity literature, a weakness can be identified in that existing measures treat construction mostly as pure production of goods and downplay the services aspect of construction projects. Determining input and output qualities is crucial for productivity measurement and data can be captured from project performance benchmarking schemes.

The purpose of the thesis is to investigate how construction performance is measured by focusing on refurbishment site managers'

monitoring and management of resource use. The object of investigation is site managers of building refurbishment projects. The empirical data were collected in Sweden through 47 semi-structured interviews, a pilot questionnaire survey and a national questionnaire survey in Sweden, all designed to collect information from site managers. The national questionnaire was distributed by e-mail first and then to initial non-respondents by post in paper format.

Refurbishment is different from new construction and the services nature of refurbishment is stronger. Typical service characteristics, namely intangibility, heterogeneity, perishability and inseparability of production and consumption are found in refurbishment projects. Auto repair, industrial maintenance and surgical services share with building refurbishment an important element of uncertainty associated with the condition of the object that is to be serviced. Although restrained by design provided by the client, a refurbishment contractor can influence resource use during a refurbishment process. Skill in managing resource use does not only influence productivity, but also improves environmental sustainability.

Findings show that refurbishment site managers currently monitor resource use in refurbishment sites with only simple area-based measures such as hours/m² and materials/m². Lack of methods and lack of time for measuring and reporting are mentioned as major problems by site managers. Claiming “lack of time” probably means that site managers prioritize other tasks such as completing projects on time instead of spending effort on monitoring. Refurbishment is characterized by demolition activities that generate solid waste. Regulations require solid waste to be registered, especially in the case of hazardous waste. Keeping records of waste amounts and the way they are managed are examples of how sustainability issues transform project monitoring on sites.

In order to facilitate resource use monitoring, ICT tools are used on refurbishment sites. In decentralized organizations, local managers' tool choice is influenced heavily by individual acceptance. The UTAUT (Unified Theory of Acceptance and Use of Technology) synthesis model explains an individual's media choice can be explained with four constructs: performance expectancy, effort expectancy, social influence and facilitation conditions. Here, the findings suggest that site managers' ICT choice is influenced more by performance expectancy than by

effort expectancy. In larger projects, more extensive ICT support is used, mainly because it is possible to spread costs of project-specific investment in ICT. The national questionnaire survey asked about site managers' choice of media (laptop, tablet, mobile telephone, printer and pen and paper) for eight resource monitoring activities. Laptops were found to be the most frequently used tool followed by pen and paper, while there is a trend of using more laptops and less pen and paper. Pen and paper are used both to support information sharing (use of printers) and to restrict information sharing (use of pen and paper for private notes). Tablets are rarely used at work, although a majority of respondents use tablets at home. Patterns of ICT use are influenced by the need for joint problem solving.

The questionnaire also allowed a comparison between web and postal respondents. Small differences were found between these two groups: (i) respondents in larger firms were more likely to have responded to the web versions, (ii) web respondents prefer laptops in colder environments, (iii) postal respondents use pen and paper more often when there is a need for updating project information and also to record private information for their own use, (iv) postal respondents use laptops more frequently at home than web respondents do.

The thesis also identifies questions for further research. Decentralization gives flexibility to local managers in a project services context, while it makes it more difficult to align local managers' activities with organizational goals and strategies. Therefore the question is how decentralization of decision-making should be shaped so as to ensure good performance in projects with many uncertainties. Today, project performance in the construction industry is measured as deviations from original plans which is a dubious practice since original schedules and budgets can be biased. Another question worth more study concerns the negative effects on performance if measurement is primarily in terms of deviations.

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Eleni GIANNOPOULOU (2016), *The Role of Research and Technology Organizations (RTOs) in Open Service Innovation – A dual Perspective*, PhD in economics, University of Strasbourg, Strasbourg (France), 25 November 2016.

Supervisor: Julien PENIN, Professor University of Strasbourg. Scientific advisor: Pierre-Jean BARLATIER, Researcher HDR, Luxembourg Institute of Science and Technology. Opponents: Faïz GALLOUJ, Professor, University of Lille 1, Cécile AYERBE, Professor, University of Nice Sophia-Antipolis. Other members: Robin COWAN, Professor University of Strasbourg; Anna YSTROM, Associate Professor, Chalmers University of Technology

In the current complex and networked innovation landscape, new paradigms such as the “open innovation” paradigm emphasize the benefits of R&D openness and collaboration. In this context special attention has been given in the relationship between academia and industry and its positive impact on the innovation outcomes. But this literature is too much focused on universities. The public research landscape does not only comprise universities though. The Research and Technology Organisations (RTOs) are also an important part of the academic and public research world and a contributor in the current complex knowledge economies.

According to the European Association of RTOs (EARTO), RTOs are defined as “organizations which as their predominant activity provide research and development, technology and innovation services to enterprises, governments and other clients...” (EURAB, 2005¹). Moreover, they have a distinct place in the national innovation systems, being positioned between academia and industry and having strong links with the government.

Despite the important presence of RTOs in national innovation systems, we manifest a scarcity of publications about their particular

1 EURAB (2005) Research and Technology Organizations (RTO) and ERA (European Research Advisory Board), p. 1–23.

role in open and collaborative innovation. Moreover, RTOs are often blended and studied together with universities. The purpose of this PhD project is, therefore, to study explicitly the role of RTOs in the open service innovation landscape by taking a dual perspective; namely an internal and an external one. More specifically, our research focuses on two research questions: 1. What constitutes the service innovation capabilities of RTOs and 2. What is the role of RTOs compared to universities in the science-industry relationship?

In order to answer the first research question, in the first part of the project, we study RTOs from the internal perspective. Building on the resource based view of the firm, the resource-process framework of service innovation, and the NSD process literature we construct a theoretical framework for the development of service innovation capabilities in RTOs. Then we empirically confront this theoretical framework following a qualitative approach with case studies in four selected and renowned RTOs in Europe. The multi-case analysis resulted in a thorough mapping of resource –and process-related practices that support the particular and unique service innovation capabilities of RTOs. Subsequently, we focus on creativity as the core element of successful innovation management, taking a more in depth analysis of our data. Our study enabled us to identify seven creativity reinforcing capabilities in service innovation; namely attracting creative people, stimulating creative environment, combining diverse input, providing relevant resources, breeding creative ideas, opening up to external influences and accepting risk, failure and criticism.

In the second part of the project we take an external perspective on RTOs, focusing on their role between science and industry in the open innovation context. First we attempt to compare RTOs to Technology Transfer Offices (TTOs) of universities as innovation intermediaries, through the lens of two renowned theories, namely the transaction cost theory and the knowledge based view of the firm. Our results indicate that while the role of TTOs is to reduce the transaction costs of innovation by merely transferring already existing scientific knowledge to the industry, RTOs are more involved in the innovation process by fostering collaborative relationships with their industrial partners throughout the innovation process; allowing for the transfer of tacit knowledge and co-creation of new knowledge.

In the empirical part that follows, we compare RTOs to universities based on econometric analysis of the Community Innovation Survey micro-data from eight European countries. The objective of this part of the research was to understand: what “kind” of innovation are the firms, which deem RTOs as more important sources of knowledge than universities, more likely to develop. Our results show that firms that consider RTOs as more important knowledge sources than universities: (i) are more likely to develop service innovation, (ii) have less need to invest in internal R&D but (iii) are less likely to be innovative and (iv) are less likely to develop world first innovation.

The overall conclusions of this PhD project indicate that the role of RTOs in open service innovation is not only to be simple intermediaries between academic knowledge and industrial application, as widely believed until now. RTOs are advanced types of intermediaries that are actively involved in the co-creation of new knowledge and unique actors in the national innovation systems that are able not only to facilitate but also to catalyze the innovation process.

Our research has several theoretical and practical implications. As far as theoretical implications are concerned we have managed to contribute significantly in the knowledge regarding RTOs by better understanding what makes RTOs unique in the development of service innovation. Moreover, our contribution is also valuable for the field of service innovation, where the concepts of capabilities remain still abstract and rarely relevant empirical studies have been employed. Furthermore, we have also contributed to the knowledge about RTOs by comparing them to universities. Our results contribute in better understanding the different roles of these two public research actors in the open innovation context.

As far as practical implications are concerned, our study can help the industry understand the benefits that they can reap by collaborating with RTOs. RTOs are not only knowledge transfer organizations but unique knowledge co-creators. Moreover, policy makers should give more importance to the special role of RTOs in open and networked innovation systems and position them accordingly compared to universities. If RTOs are indeed the new “open innovation” organizations as Chesbrough (2015) points out, then the support of the government is indispensable, though available funding or structural supporting

mechanisms for collaboration, in order for RTOs to be able to unveil the whole spectrum of their capabilities.

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Heidi KORHONEN (2016), *Customer orientation in industrial service innovation*, PhD, Aalto University, School of Science, Department of Industrial Engineering and Management, Aalto (Finland), 2 September 2016.

Supervisor: Eila JÄRVENPÄÄ, Professor, Aalto University. Thesis advisor: Marja TOIVONEN, Research Professor, VTT Technical Research Centre of Finland. Opponent: Faiz GALLOUJ, Professor, Lille 1 University.

Customer orientation is a business approach that emphasizes customer value and satisfaction of customer needs. It is widely seen as beneficial for business and innovation. It is an evolving concept that can be applied in various ways in different contexts. There is a need to better understand customer orientation in today's context of industrial service innovation.

Scholars use the concept of service in two different ways. Both ways are important for the study of industrial service innovation. The first way emphasizes the distinction between goods and services. From this viewpoint services are essentially non-goods and can be described e.g. as processes or operations. The other way the concept of service is used emphasizes value for the customer, which is also the core idea of customer orientation. This way of using the service concept is becoming increasingly common. From this viewpoint service is about acting for the benefit of the customer, supporting customer's value creation, or satisfying customer needs. Such service is delivered through both goods and services and often through their combinations.

Industrial structures of production and consumption are being fundamentally changed. In this industrial transformation the share of services in comparison to goods has grown. Manufacturers have gradually

shifted their innovation efforts traditionally focused on technology and physical goods more towards services and customer value. Innovation discussion has also shifted from the producer centric views more towards user driven and open innovation. This has made customer orientation an increasingly important issue for manufacturers. Simultaneously, manufacturers have had challenges in becoming customer oriented and in innovating industrial services.

The industrial transformation has been highly affected by the increasing adoption of IT that continues today as digitalization. IT has helped industrial companies split their production processes to smaller parts and outsource them which can be seen in statistics as an increase in services. Often such outsourcing simply aims at lower cost. However, outsourcing can improve service quality and customer value through increased learning that takes place when manufacturing companies specialize and aggregate similar work over many customers. Customer oriented manufacturers can develop their capabilities for creating knowledge in interaction with customers and offer these capabilities as service. Recent digitalization further enables manufacturers to use information and knowledge in new smart ways to serve customers. The need to better understand customer orientation in industrial service innovation is accentuated.

The research is based on four previously published studies and employs abductive case research strategy. The empirical data has been collected from 31 manufacturing and technology companies in the business-to-business context. 16 companies have been studied in the supplier role and 15 in the customer role.

The first study is a multiple case study that investigates the difficulties experienced by many manufacturers in getting their customers to adopt new service innovations. The difficulties seem to stem from manufacturers often having an inadequately narrow view of business customers and their needs. The results emphasize the nature of business customers as complex networks of individuals and groups of people. These people have different and changing needs and service experiences which affects the way they resist or advance innovation adoption.

The discussion on business customers and their needs is deepened in the second study that is a theoretical study. It takes the stand that needs in the business-to-business context are different from human needs

but that there is a relationship between them. Based on a discussion on human needs and on organizations as nested human systems facilitating value co-creation, the study puts forward a novel framework of customer needs in the business-to-business context.

The third study is a multiple case study. It stems from the view developed in the first two studies that customer needs change in networked interaction. This view opens novel perspectives to customer involvement. The results emphasize strategic combining of open and closed innovation. They further describe industrial companies involving customers in service innovation in order to shape the context of value co-creation, foster network effects, ease living with contingency, and engage in business with meaning.

The three first studies lay ground for understanding the nature of customer value and how it is co-created in nested human systems. The fourth study uses this view of value as co-created in order to investigate innovation from a broad perspective. It describes different innovation types through a single conception of innovation and uses a single case study to illustrate the conception. Innovation outcomes are presented as new practices of systemic value co-creation. Goods, services, and technologies are manifestations and enablers of these practices. The aim of development efforts needs to be on systemic value co-creation, not on products and services as such.

As a whole the research deepens the understanding on the nature of customers, customer needs, customer involvement and customer value. It is suggested in the managerial implications that in the current transformation of industry a new approach to customer orientation is needed that is based on this deepened understanding. A wider view than the customer-supplier interaction or the linear value chain should be taken and industrial service innovation should be seen as nested systems change. Then innovation not only encompasses products and services but wider ecosystems where humans and the society are essential actors and beneficiaries. Customers and other stakeholders are inherently involved in innovation. The new approach requires a focus on value co-creation at multiple systems levels and in multiple directions. It also requires management of co-development utilizing both open and closed innovation, and creation of favorable dynamics for interactive learning.