Analysing the dynamics of IT innovations development. The case of portals in the automotive industry

ANALYSING THE DYNAMICS OF IT INNOVATIONS DEVELOPMENT – THE CASE OF PORTALS IN THE AUTOMOTIVE INDUSTRY[1]

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ABSTRACT

Since the 1960s, the development of IT innovations – from simple accounting systems to more complex management information systems in the 80s, to e-commerce applications in the 90s and web services and technologies in the new millennium – have redefined not only the way organizations co-ordinate their internal activities and business processes, but also the way they manage their external relations with their customers and suppliers [1]. One such IT innovation are portals. They are defined as interlinked electronic platforms with a single point-of-entry that enable collaboration within and between organizations through access to different organizational information systems. The objective of the paper is to analyze the socio-technical dynamics that shaped the development of a portal in the automotive industry. The paper explores the dynamics to be observed during the development process, combining economic, technical and sociological perspectives.

Key Words— IT innovations, portals, socio-technical dynamics, automotive industry

1. INTRODUCTION

Portals have emerged as a key technological innovation of the twentieth century. They are ICT-based systems that bridge organizational boundaries [2]. Since the 1970s, the development of portals, typically linking independent organizations, has increasingly been seen as an important vehicle for innovations in organizational transformations. They enable, for example, the implementation of concepts such as 'lean production' or 'business process reengineering' (BPR) [3]. Portals have redefined the roles and relations between business partners, allowing for new ways of value creation, inter-organizational arrangements, and process designs. Moreover, they contribute to the development of a networked economy, based on dynamic and flexible relations between a wide range of business partners.

The development of information systems in general, and of portals in particular, has often been portrayed in the IT literature as an exclusively technical matter. IT innovation researchers have also looked at portals through the organizational lens, interpreting IS development as a social process embedded in its organizational context [4] [5]. Our approach here is to explore portal development as a socio-technical process, shaped by both the characteristics of the technologies employed, and the socio-economic context within which development occurs.

This paper has two main contributions to the existing literature on innovation studies. First, it develops a complex framework – the MSID framework – which enables the analysis of the dynamics involved in the development of IT innovations at both micro and meso level. Second, through its empirical application to a complex multi-layered and longitudinal case study, the paper applies the framework to a real context – the automotive industry.

The remainder of the paper is structured as follows: the research design underlying the study is described in the next section. The development of the MSID framework is addressed in section 3. This is followed by sections 4 and 5, describing the case study and analyzing the adoption of the MSID framework, respectively. A discussion of the results from a management of innovation perspective concludes the paper.

2. RESEARCH DESIGN

The framework of analysis draws upon the Social Shaping of Technology (SST) perspective, by explaining ICT innovations as history- and context-specific, actor-focused technological change processes [6]. The SST framework provides the perfect tool to explore the

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complexity associated with innovation development by incorporating a multifaceted socio-technical perspective.

The research was carried out in a multi-layered and longitudinal case study. This study involved the development of Covisint, a portal technology, launched at the beginning of 2000s by four of the major European/Western car manufacturers. The aim of Covisint was to enable collaboration between car manufacturers and their suppliers, while at the same time reducing the costs along the supply chain. IBM was the technology partner, while Commerce One provided consultancy services. One of the authors of this paper worked for one of the car manufacturer companies, and was involved in the project from its inception. This author's extensive access to the complex setting of the portal development, as both participant and analyst, was essential for the development of what was to become the MSID framework, and to illustrate the ways in which theoretical concepts can be grounded in real empirical cases [7].

Data was collected over a period of four years. Ethnographic observation was used as the major method for data collection, as the focus was on what people do rather than on what they say [8]. Observation was facilitated by the researcher working on site during the period of data collection, which enabled her to obtain a deep understanding of the organization, the people, and the broader context within which they work [9]. Following [10] recommendations, the analysis of the case was based on a detailed description of the case and its settings. It also followed the iterative model proposed by [11]: data collection, reducing the volume of data through open coding, displaying the data using descriptive and explanatory data displays, drawing conclusions and doing a verification.

3. THE MSID-FRAMEWORK

SST sees IT innovation development as the result of interactions between a range of actors and forces. The innovation process development has been conceptualized as an "arena of development" which tries to move beyond the actor network concept. One of the problems, however, is that such concepts do not identify the different layers of networks that are involved in shaping innovation, especially in the case of inter-organisational network systems. To address this shortcoming, we have developed the Multi-level Space of Innovation Dynamics (MSID) framework that enables capturing the dynamics involved in the development of standardized portal technology and its outcomes on two levels:

- The micro level, focussing on individuals and groups in the adopting organization (zoom in), and
- The meso level, addressing the effects that the dynamics have in the broader context of the sector (zoom out).

The 'zoom in' and 'zoom out' perspectives focus the analysis on explaining the constant configuration and re-configuration of the various arenas and networks within which the actors are embedded. This constant re-configuration process enables us to capture the dynamics of an IONS innovation as a complex socio-technical process of change. Jørgensen's concept of an 'arena' is used to analyze the way in which the actors involved at both the company and the industry level are configured [12] (see also Figure 1).

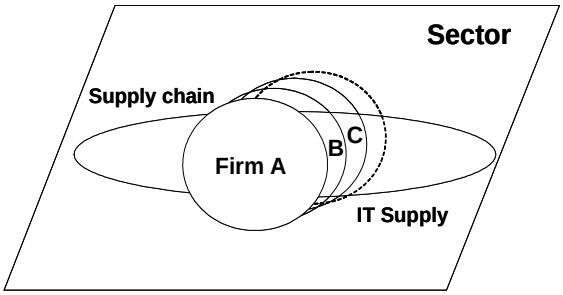

Figure 1. The development arena and the 'firm-in-sector' concept merged

The actors in the standardization arena are linked in a complex organizational setting which is characterized by two levels of analysis: the company layer as a micro level and the industry layer as a meso level [12]. On the micro level, i.e., the company layer, the actors are linked through a concrete portal and can be characterized not only by their relationships but also by their respective organizational structure and culture. Consequently, the level of analysis is much more detailed than the one on the industry level. Here, the focus is on a specific company driven by market forces and Internet-based technological innovations, and directly involved in portal initiatives. Each individual company is embedded in its industry, with its structures and processes, organizational culture, market posture or arenas of power [13]. As tthe company under study had set up a dedicated project team that had been in charge of a specific portal to improve inter-organizational collaboration between players in the industry, the nature of the relations between the individual players can be analyzed in detail, for example in terms of trust and power.

In contrast to the company layer, the focus on the meso level of analysis, i.e. the industry layer, is on the entire industry including the market with manufactured and sold products, and players such as manufacturing companies, suppliers, industry intermediaries, consultants or industrial associations (see Figure 2). The actors are linked through their supply chains which are electronically mediated by ICT

and can be characterized in terms of their role in the industry, the nature of their relationships and the pressures they are forced by.

The turbulent dynamics are analyzed as the outcome of complex processes of change involving the configuration and re-configuration of the various arenas and networks in which the array of involved organizational actors are embedded. The following case study description serves to highlight these dynamics and to illustrate how the framework can be used in practice.

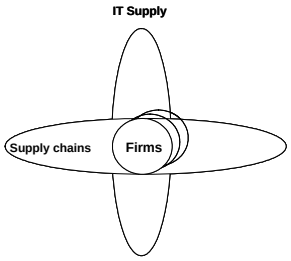

Figure 2. Companies collaborate in supply chains

4. CASE STUDY

While being one of the mature industries, the automotive sector is also very dynamic and changing at a high pace; it is constantly reshaped by tremendous technological changes ranging from new environmental-friendly sources of energy to new developments in software technologies, and by enormous market pressure (e.g., for cost reduction and through changes in customer demand). Constantly changing market requirements re-define the relationships between original equipment manufacturers (OEMs) and their suppliers, replacing the traditional arms-length relation with one characterized by ever closer collaboration in areas such as real-time forecast data exchange.

4.1. Initial situation

Prior to 2002, a Large Car Company (LCC) had launched a strategic program to ensure the networking of its entire value chain beyond the company's boundaries. The associated projects had already reduced costs and shortened throughput times to some extent, but LCC aimed at an all-out effort to press forward inter-organizational collaboration with suppliers on a global basis. In LCC's vision, such collaboration should include the integration of individual projects in the business units, as well as the integration of LCC-specific applications into a global supplier portal [7].

The integration of the company's portal activities worldwide into one single portal (called Covisint) was, among other goals, intended to get rid of the – then still necessary – multiple sign-on as well as of redundant data entries. The integration and the sharing of LCC-owned applications as well as non-LCC systems was supposed to improve supply-network efficiencies through system-driven workflows and alerts. Other goals included the provision of a single user interface to the supplier community, and to gain access to a wider number of suppliers, through the use of a standardized technology with the benefit of a shared marketplace infrastructure [1]. As a result, both external and internal triggers within the automotive arena led to the idea to develop and implement a solution that was envisioned to become the future industry standard [7].

5.2. Applying the MSID framework

The MSID framework (see section 3) will be used to analyze the case.

Zoom in – the micro level of analysis

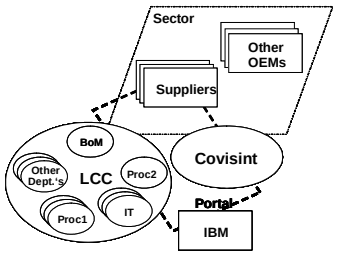

Figure 3. The micro level of analysis

The creation of, and the entry into, the standardization arena were driven by the management of e-business innovations of the central actor (LCC). As depicted in Figure 3, LCC adopted several roles at the same time, as a type of central 'Meta actor' with regard to the other actors populating the arena. In parallel, within LCC, the different departments such as IT or procurement, were playing active key roles. Other departments as well as the top management were also involved, but they were influencing the course of the project only indirectly. Furthermore, other actors, such as the intermediary Covisint (of which LCC was a shareholder, together with Ford and GM, which were competitors), the IT vendor IBM, suppliers, other OEMs, associations and other electronic marketplaces populated the arena.

The standardization arena was configured by key actors and artifacts that had driven a cascade of interactions related to the process of standardization, and influenced an array of decisions during the negotiations of the standardized technology, including, for example:

- The decisions in the planning/strategy phase that were shaped by the context and history and the pre-project phase.

- The decisions made during the development and implementation phase that were shaped by the project configuration (structure) and the negotiations of the key actors (action).

In summary, the micro level of analysis enabled the study of the arena's configuration, and of the course of the entire portal project from a very detailed and close perspective, without compromising the meso level of analysis, or losing the overall picture.

Zoom out – the meso level of analysis

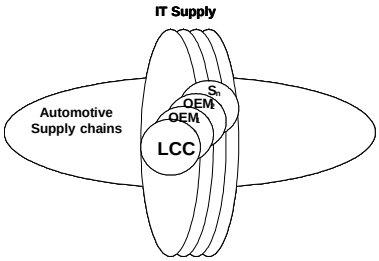

Figure 4. The meso level of analysis

The central actor is engaged in different types of relations, including, for example, shareholding (e.g. an OEM is shareholder of an intermediary) and strategic alliances with business partners (e.g., suppliers) or competitors (other OEMs). Those linked supply chains of key players in the sector are largely based on existing relationships (procurement contracts). These relations are represented through inter-organizational processes between at least two different actors. These processes, in turn, are based on underlying IT systems, i.e., inter-organizational systems and software such as portals or e-marketplaces. Consequently, the standardization arena is populated by the actors (OEMs, suppliers) and their supply chains, competing or cooperating, and linked via IT solutions. This new type of relation – competition and negotiation occurring in parallel – may lead to the construction of networks of companies and other actors trying to negotiate between competing technologies and standards by creating new, integrated solutions. This involves moving between locations and the assembly of new integrated locations (Jørgensen & Sørensen, 2002). In this context, standards and standard setting play an important role. Standards enable cross-company interoperability of supply chains. Standard setting may be the decisive factor regarding success or failure in the case of competing supply chains.

5. DISCUSSION AND CONCLUSION

The framework was applied to the project configuration and identified the areas that shaped it from its very beginning. The study suggests that the organizational politics of decision-making processes between the actors involved in standardized portal development and implementations patterned the dynamics and the subsequent outcomes of the standardization process. In this context, the study highlighted the role that misunderstandings, the pursuing of various interests, and the conflicts and power struggles between the actors played in shaping their actions, and ultimately the outcome of standardization process. The analysis shows that the unfolding outcomes were shaped by the dynamics during the distinct phases before and during the project. These dynamics explain the trade-offs and the partial failure of the portal standardization process to achieve an industry-wide standard and to benefit the companies involved. The trade-offs were caused primarily for two reasons: first, by a number of competing concerns about portal functionalities on an organizational and on an individual level and, second, by the interconnectedness of an intra- and inter-organisational world, incorporating collaboration and competition and a mixture of both.

For example, consider the lock-in of existing practices and technologies at LCC, and the diverse strategies of the key actors negotiating the 'Best practice industry processes'. Negotiations and the distributed decision-making were influenced by interpretations and transformations of ideas, visions and interests on both the departmental and individual level. This led to a shift of the project goals, and had expected as well as unexpected effects on the outcome. This holds for all actors of the standardization arena. The exploration of the dynamics of standard setting – including both the global and the local perspective – enabled the discovery of a drift between the expected and unexpected outcomes. The increasing network of individual organizations supported by global IT infrastructures has stimulated research on the dynamics of large information infrastructures, as [14] have shown.

The findings of the study, however, indicate that some configurations are more likely to happen than others. More specifically, the project configuration, as it had been set-up in this particular case, was largely patterned by the three factors pre-project phase, the external context (i.e., the market), and the internal context (i.e., the organizational structure). In general, projects are drivers of change and their initiation reflects the goals that the project sets out to achieve. The global supplier portal project was not a conventional project but a Meta project consisting of different individual projects. Consequently, the sophisticated project configuration was beyond usual project set-ups, and mirrored not only the complex organizational structure of LCC but also had to consider the structures of Covisint. The

project configuration reflected the experiences of previous projects carried out during the pre-project phase.

Apart from the configurations in the standardization arena, the analytical framework enabled the identification of the interaction of key players by translating their visions and knowledge into artifacts. Herein, power and expertise turned out to play a significant role. Both were found to be critical variables that shaped the decisions made by the different actors, thereby explaining the reasons why some decisions became more likely and important than others, and also explaining why some other decisions were never taken.

The picture we found was far removed from the simple (technical or economic) rationalities envisaged by economic, strategic management, or technocratic accounts. Rather, the case-study highlighted the close interplay between

- the unfolding standardization efforts and the complex socio-technical setting in the array of firms involved, including supply chain relationships;
- the array of existing installed technologies and attendant relationships between technology supply;
- the complexities of inter-departmental and inter-organizational politics.

The study found that ICT innovations are shaped by history and context of the adopting organization and of the actors involved. The extremely complex organizational politics of decision-making processes were patterned by the configuration of the project and the management of expertise. Interactions and re-alignments between this complex set of socio-technical factors led to a drift in the subsequent outcomes. This study supports the socio-technical analysis of supply chains as mutually shaped by technology and the adopting user organization.

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