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SERVICE INNOVATION: ORGANIZATIONAL ROUTINES, TECHNOLOGY AND CHANGE PROCESSES

PhD THESIS

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Introduction

The overall research objective of this dissertation is to contribute to knowledge and theory about innovation and change in service organizations. Indeed, the dissertation simultaneously draws on a variety of research streams and literature traditions, mainly at the intersection between service innovation and organization studies. It is based on a multi-paper format and, specifically, it includes three complete and related essays. The studies are complementary in nature, since they address different aspects inherent to the same general research topic. However, each study has its own research objective and, as such, can be read in complete autonomy from the others. The next section sketches the theoretical background of the dissertation, highlighting the core theoretical arguments inherent to innovation and change in service firms and showing the main research gaps. Then, we introduce the concepts and the perspective adopted to study organizational and change processes in service firms. Finally, we present the three essays in more detail, explaining the specific research gap that they address.

1.1. The general background: a brief overview

Over the last few decades, innovation research has started to devote increasing attention to services and service organizations, reverting an enduring preference towards manufacturing and new product development processes (Menor et a., 2002; Miles, 2006; de Vries, 2006). A broad variety of terms, concepts and typologies have been adopted in service innovation research to describe what is included in the concept of innovation and where it happens in service firms (Droege, Hildebrand & Forcada, 2009; Schilling & Werr, 2009; Miles, 2010; Crevani et al., 2011). At the same time, new service development (NSD) has emerged as a key research field within innovation and service management literature (Miles, 2006; Menor & Roth, 2007; Papastathopoulou & Hultink, 2012).

However, the debate about the specific nature of innovation in service is still open and, for some aspects, controversial. Specifically, the main problems regard the following aspects:

a) the traditional conceptualization of service innovation as a change in one or more dimensions of a complex service innovation system (e.g. den Hertog, 2000; Gallouj & Weinstein, 1997; Gaco & Rubalcaba, 2007);

b) the intentional distinction between organizational innovation and change in service firms (Drjer, 2006; Tether & Tajar, 2008; Rubalcaba et al., 2010);

c) the poor understanding of emergent forms of innovation in services, the predominance of a structuralistic perspective in studying innovation in service organizations and the shortage of studies devoted to the "organization" as a specific dimension of the service innovation process (Slappendel, 1990; Jaakkola & Kaatermo, 2010; Crevani et al., 2011;);

d) the predominance of a structuralistic and macro-level perspective in identifying the relationships between technological and not technological forms of innovation (Gaco & Rubalcaba, 2007).

Our dissertation aims at handling in depth with all the above limitations. To this end we chose to move into a specific direction, i.e. that of creating a sound bridge between distinct and largely autonomous research traditions: on the one hand, we draw on a variety of research disciplines on services and service organizations (and in particular service marketing, service operations management and service innovation streams); on the other hand, we look at organizational literature and, more specifically, on three related and complementary areas of research: a) studies on organizational routines; b) studies on technology and organizing; c) studies at the intersection of the previous streams that expressly apply an interactive, practice or critical realistic perspective on studying organizational change processes. These studies are conducted at a micro-level of analysis, focusing on daily practice and routines as they are carried on by people in the organization.

1.2. The three essays

The first essay is theoretical in nature, aims at building theory on innovation and change in service firms, mainly addressing the points a), b) and c). The second essay draws on the key concepts and theory developed in the first essay and is also theory-building. It is empirical in nature and it is based on a longitudinal, explorative and inductive case study carried on in a service firm. The last essay draws on a different theoretical background and, then, is loosely coupled with both the first and second study, that actually can be viewed as companion essays. However, it explores aspects inherent to organizational change processes in a service firm as they are mediated by technological innovation. In fact, in writing this essay we relied on the same data

used in the second study. As such, it offers the opportunity to address the limitation described in the point d).

1.2.1. The first essay

In the first essay, we build the foundations for a process theory of service innovation. Our point of departure is the existing literature on innovation in service firms and new service development processes (Edvardson & Olssen, 1996; Weinstein & Gallouj, 1997; Den Hertog, 2000; Toivonen & Tuominen, 2009). Both research streams have largely addressed the issue of understanding the nature of service innovation. Nevertheless, available concepts and analytical frameworks still leave us with uncertainty and unsolved problems. In order to fill these gaps, we propose a new conceptualization of service innovation that is based on the concept of organizational routines (Nelson & Winter, 1982; Cyert & March, 1963; Becker, 2004) and adopt it within a more general framework that models service innovation as a complex structuration process (Giddens, 1984). Coherently, we propose to study service innovation processes by adopting a practice-based perspective (Orlikowski, 2000; Feldman & Orlikowski, 2011). In this essay we show how services and organizational routines have been largely treated as two different and autonomous entities in business and management research, representing the analytical focus of quite distinct literature traditions. However, we argue that these two entities share a similar ontology since they are both constituted by recurrent interaction patterns and accordingly we will discuss the foundations of such a common root. We will then show the benefits inherent to the new definition and theoretical perspective. Finally, the interdependences between changes in service delivery routines, that is our unit of analysis to assess innovation, and changes in other classical service innovation dimensions will be discussed in more detail, pointing to the opportunities of integration and cross-fertilization between service innovation and organizational routine research.

1.2.2. The second essay

In the second essay, that can be viewed as a close companion to the first one, the analytical and explicative power of the new conceptualization of service innovation based on the concept of organizational routines is showed through a case study research explicitly designed to explore the nature of service innovation by relying on

a practice lens. More specifically, we address the following research question: "How does service innovation emerge through changes in delivery routines?". To this end, we trace the co-evolutionary changes that relate the traditional service delivery system dimensions with organizational (and inter-organizational) routines as they develop during the innovation process. The case study analysis shows the explicative and analytical potential of the new concept of service innovation that not only is consistent with its multi-dimensional nature, but is simultaneously able to capture variations in the service delivery system, the service process, and performance outcomes as well as to assess discontinuity and replicability. Furthermore, the analysis of micro-changes in the selected routines revealed that innovation stems from the complex interaction between deliberate and emergent changes enacted in daily routines and is highly influenced by human agency. Definitively, through this essay we want to show how in understanding service innovation traditional descriptive models can largely benefit from the concept of organizational routine whereas the predominant structuralist perspective can be fruitfully integrated with an interactive model embracing practice-based concepts, such as structuration, enactment and human reflexivity.

1.2.3. The third essay

The last essay is about organizational path dependence. The concept of path-dependence has been largely adopted in management and organization theory to indicate how history matters in explaining strategic or operational persistence as well as lock-in states in organizations. However, only recently the relevant literature has "re-discovered" its original meaning and started to address its analytical and explicative power in a more systematic and fruitful way. The essay goes further in this direction through examining the path-dependence process that unfolds over time in an organization as the co-evolution of operational routines and related technology shape the self-reinforcing dynamics that gradually can reduce organizational adaptation capability. We tackle the research question through conducting a longitudinal, explorative and inductive case study in an Italian middle size service firm and build our analysis on qualitative and processual data.

The study adds new insights in the process of path-dependence that occurs at the level of technology and routines in the organization. More specifically, the empirical results helped us to cast light on how the self-reinforcing mechanisms that gradually

restrict the range of possible actions simultaneously work, often in conjunction, at the level of both technologies and routines. The essay also shows how the adoption of a critical realistic perspective is particularly suitable to explore such a co-evolutionary paths over time. More importantly, the research is able to cast light on how the self-reinforcing mechanisms actually strengthen or reduce the range of possible actions under the influence of previous configurations of technologies and routines in practice that emerge at the end of each social interaction cycle. Under their influence, the actual scope of human action can progressively be reduced over time since human agency tend to exert less reflexivity when to face unexpected events or emergence situations.

2. ESSAY 1 - IDENTIFYING THE SOURCES OF REPLICABILITY AND CHANGE IN SERVICE INNOVATION

Abstract

Service innovation research has largely addressed the issue of understanding the nature of service innovation. Nevertheless, concepts and analytical frameworks proposed in the literature still leave us with uncertainty and unsolved problems especially with regard, the sources of replicability and change. Indeed, both elements should coexist in service innovation processes and then the related trade-off needs to be addressed. In this essay we aim at building the foundations for a new conceptualization of service innovation that is based on the concept of organizational routines. Coherently, we propose to study service innovation processes by adopting a practice-based perspective. Services and organizational routines have been largely treated as two different and autonomous entities in business and management research, representing the analytical focus of quite distinct literature traditions. However, we believe that times are ripe to create a solid bridge between them. We argue that services and routines share a similar ontology since they are both constituted by recurrent interaction patterns and our aim is to build the foundations of such a common root. We will show the benefits inherent to the new definition and theoretical perspective. Furthermore, the interdependences between changes in service delivery routines, that is our unit of analysis to assess innovation, and changes in other classical service innovation dimensions will be discussed in more detail, pointing to the opportunities of integration and cross-fertilization between service innovation and organizational routine research.

2.1. Introduction

A broad variety of terms, concepts and typologies have been adopted in service innovation research to describe what is included in the concept of innovation and where it happens in service firms (Droege, Hildebrand & Forcada, 2009; Crevani et al., 2011). Acknowledging that it is a complex and multi-dimensional phenomenon, a number of frameworks have been proposed by scholars in order to thoroughly understand what service innovation means and to analyze it at the organizational and network level (e.g. Edvardsson & Olssen, 1996; Den Hertog, 2000; Weinstein & Gallouj, 1997; den Hertog et al., 2010). As for the nature of service innovation processes, more recent empirical research have underlined the need to explore emergent forms of innovation next to those strategically planned and formally executed (e.g. Dolfsma, 2004; Toivonen & Tuominen, 2009; Crevani, Palm, & Schilling, 2011). However, a number of unsolved questions and problems remained regarding the nature of service innovation, both when it is considered as a result and as a process. Indeed, a unifying perspective on both aspects still is absent in service innovation research.

Our aim is to provide a theoretical contribution to service innovation literature through addressing the controversial and at least partially unsolved debate about its complex, multi-dimensional and often emergent nature. To this end we build on the concept of organizational routines (see Becker, 2004 for a review) to propose a new conceptualization of service innovation. Our point of departure is the acknowledgment that services and routines, although traditionally treated as different entities within distinct research traditions, essentially share a common ontology and how this is probably to the roots of similar challenges, trade-offs and theoretical development paths. Accordingly, we will show the analytical and methodological advantages of framing service innovation as " a form of organizational routine change" as well as the cognitive insights achievable from the adoption of a practice lens (Orlikowski, 2000; Feldman & Orlikowski, 2012) and of an interactive perspective (Slappendel, 1996) in studying complex service innovation processes.

The paper is structured as follows: in the first part of the essay, we will review existing literature on service innovation and new service development (Den Hertog, 2000; Weinstein & Gallouj, 1997; Edvardson & Olssen, 1996; Toivonen & Tuominen, 2009), pointing out specific problems inherent with traditional definitions

and theoretical perspectives. In the second part of our work we will propose a new conceptualization of service innovation based on the concept of organizational routines in order to build the foundations of a process theory of innovation in service firms (Mohr, 1982). In this section, we will tackle the common ontology of services and routines and show the commonalities of problems and challenges addressed in their respective research tradition, pointing to the opportunity to create a bridge among them. Principally drawing on organizational literature on routines, the last part of the paper aims at showing how the dimensions of a service innovation system can be linked to changes in the organizational routines involved in the service delivery, thoroughly exploiting the theoretical and analytical power inherent in the new proposed ontology of service innovation.

2.2. Service innovation research: addressing some crucial and unsolved issues

Within service innovation studies, the so-called technologist approach (Barras, 1986; 1990), where technology was taken as the only dimension of service innovation and a marked distinction was made between product and process parts of services, was highly criticized in subsequent studies in the demarcation (e.g. den Hertog, 2000; Hipp et al., 2000; Van der Aa & Elfring, 2002; Howell, 2006) and synthesis schools of thought (e.g. Gallouj & Weinstein, 1997; Drejer, 2004; Miles, 2005). These research streams have recognized the difficulty of adopting a clear-cut distinction between process and product innovations as well as the existence of a number of non-technological forms of innovations in the context of service firms. In this respect, within the broad variety of non–technological innovation forms, organizational innovation has been receiving increasing attention in research and management practice (e.g. van der Aa and Elfring, 2002; Vermeulen & Van der Aa, 2003; Tether & Tajar, 2008; Rubalcaba et al., 2010). Indeed, there are a number of different interpretations regarding the term "organizational innovation" (Lam, 2005) and the lack of a widely accepted definition caused difficulties in adopting reliable measures and indicators (Armbruster et al., 2008; Rubalcaba et al., 2010). What is worth highlighting here is that in the attempts to develop an adequate methodology for an organizational innovation monitoring system, scholars have largely relied on the "organizational change/innovation" dichotomy. According to the Oslo Manual (OECD, 2005:179): "The distinguishing features of an organizational innovation

compared to other organizational changes in a firm, is the implementation of an organizational method (in business practices, workplace organization or external relations) that has not been used before in the firm and is the result of strategic decisions taken by management". However, not denying the value of such a distinction for elaborating technical policies, we argue that a clear-cut dichotomy is not reliable for the management research and practice. Indeed, organizational innovation (as well as other forms of service innovations) cannot be empirically investigated only as the result of deliberate decision-making processes made by management, since emergent, cumulative and bottom-up changes could have the same innovative impact for the service organizations and their businesses (e.g. Toivonen & Tuominen, 2009; Furslang, 2011; Crevani et al., 2011). A similar argument can be made with regard to the distinction between innovation and organizational learning made by service innovation scholars (Sundbo, 1997; Gallouj & Weinstein, 1997). Although we agree that organizational learning is a smooth development process whereas innovation creates a jump in the evolution (Sundbo, 1997), we also recognize that in a behavioral perspective (Cyert & March, 1963) understanding how innovation emerge, develop and grow within the organization requires that theories of organizational learning (e.g. Argyris & Schön, 1978; Senge, 1990) are not put apart from the discussion (and this is especially true in the case of "incremental" innovations) but integrated within a more general theory of service innovation.

Acknowledging that innovation in services is a complex and multi-dimensional phenomenon, a number of frameworks have been proposed by scholars in order to thoroughly understand what service innovation means and to analyze it at the organizational level (Droege, Hildebrand & Forcada, 2009). Within the demarcation school, Edvardsson & Olsen (1996) discuss the innovation issue from the viewpoint of "what can be changed" (Droege, Hildebrand & Forcada, 2009) and propose that anyone of the three basic components of a service can be changes in the innovation process: i) the service concept; ii) the service process and iii) the service system. It is worth highlighting that, according to the authors the "service process" is different from the "customer process". In fact, the first refers to the prototype or model for various customer processes and as such it includes the description of the chains of activities that must function to produce the service; conversely, the last takes place

only when the customer activates the service process and hence it corresponds to the actual performances enacted during the service production and delivery. In his model of service innovation, also referable to the demarcation approach, den Hertog (2000) proposes to analyze the phenomenon through mapping the changes that occur in four intertwined dimensions, namely: i) the service concept; ii) the client interface; iii) the service delivery system and iv) the technological options. Such a model has been extended in a later study (den Hertog, van der Aa & Jong, 2010) where service innovation is defined as "a new service experience of service solution that consists of one or several of the following dimensions: new service concept, new customer interaction, new value system/business partners, new revenue model, new organizational or technological service delivery system"(pag.494). The inclusion of the "system/business partners" dimension largely derives from the increasing importance recognized to distributed innovation processes also for service firms (e.g. de Vries, 2006; Tether & Tajar, 2008; Chesbrough, 2011) whereas the elaboration of new models for distributing costs and revenues is viewed as a prerequisite for successful service innovations. Within the most recent synthesis stream, Gallouj & Weinstein (1997) developed the so-called "characteristic-based" model of service innovation, subsequently operationalized, refined and extended (Djellal & Gallouj, 2005; 2008; de Vries, 2006; Windrum & Garçia-Goni, 2008; Gallouj & Tuominen, 2011). Elaborating on the Lancasterian characteristic-based model proposed by Saviotti and Metcalfe (1984), the authors argue that service innovation consists in any change in one or more of the following interlinked dimensions (or vectors): i) the service outcome characteristics (i.e the   final's user value); ii) the internal competence sets of the service provider (including individual codified or tacit skills); the external competencies of the customer-user ; iii) the material (e.g. IT system, equipments and artifacts) technical characteristics and immaterial technical characteristics (organizational competences or codified knowledge and routines) of the service provider, including technological and not technological components of the process employed to produce the service characteristics as well as organizational components. The changes can be planned or intentional (e.g. the outcome of R&D processes) or unintentional, that is, emerging from natural learning process by the agents involved. The authors also defined the basic mechanisms that lead to changes, namely evolution or variation, disappearance, appearance, association and dissociation and, accordingly, innovation is defined not as a result, but as a process

(Gallouj & Savona, 2009). Taking into account the contribution of customers and other network organizations, De Vries (2006) add the vector of the customer's technical characteristics whereas Windrum & Garçia-Goni (2008) introduce the vectors of other providers' technologies and competencies. Furthermore, in their evolutionary model of health services innovation, they also add a cognitive component, endowing agents with the vector of preferences. Djellah & Gallouj (2005) combine the original model of Gallouj & Weinstein (1997) with the work of Hill (1999) with the aim of exploring service innovation in the case of assembled services (e.g. hospitals). Decomposing the overall service package in its constituent services, each of them include basic groups of operations (i.e. associated with specific targets (namely material objects, information, knowledge or individuals). In their model, the competences of the service provider are mobilized in order to obtain the desired service characteristics for each single constituent service and target. Finally, Gallouj and Toivonen (2011) improve the characteristic-based approach in order to make the service process more visible. To this end, they separate the process characteristics from the technical ones and adopt the separation between the front-office and back-office for all groups of the characteristics, dividing them into those actually mobilized in the client interaction and those preparing or being based on this interaction (p.40). According to the new model, back office technical characteristics include, among others, the service concept, the prototype of the process, technologies, models and methods and the organization, whereas front-office technical characteristics include the technologies, physical artifacts and organizational elements mobilized in the interaction with the customer. Conversely, back-office process characteristics comprise all those parts of the service design and production which takes place outside of the customer contact, while those including customer contact belong to the front-office process characteristics. Finally, in the back-office competencies both organizational and individual competences are included, whereas the front-office solely refer to the individual ones mobilized during the service encounter.

Hereupon, we recognize that all the described frameworks have provided a valuable contribution in understanding what service innovation means and where it happens in the organization, that is, to describe its constituent dimensions. In this respect, it is also worth underlining that all analytical frameworks expressly point to the

interrelated nature of innovation in services and to the interdependence and mutual interaction that often exist between different service innovation components, dimensions or vectors. However, similarly to what has already happened with regard to the "service concept " (Goldstein et al., 2002; Fynes & Lally, 2008), the need to break down service innovation into its components has resulted in the weakening of a holistic and unitary picture and, more specifically, in the difficulty to assess if a change in one or more dimensions actually result in an innovation in the Schumpeterian sense (Drejer, 2004), that is, it is repeatable, discontinuous and leading to higher performance (e.g. Furslang, 2011). Literature on service innovation has handled the debate about replicability and discontinuity especially with regard to "ad hoc innovations" and "formalization innovations" (Gadrey, Gallouj, & Weinstein, 1995; Gallouj & Weinstein, 1997). Defined as an "interactive social construction to a particular problem posed by a given client" (Gallouj & Weinstein, 1997:549) an ad hoc innovation is only indirectly reproducible through the codification and formalization of the experience and competences developed in constructing the particular solution. According to Drejer (2004:557), such form of innovation challenges the basic principle of innovation since it is not directly reproducible, whereas the process of codification and formalization described by the authors is part of cumulative learning, competence development and continuous adaptation and as such it is part of the day-to-day functioning of a business (Windrum & Garçia-Goñi, 2008: 653). Similar problems also are faced with formalization innovation, since formalization is seen as an important process in all forms of service innovation, but not an innovation in itself (Drejer, 2004; de Vries, 2006). With regard to discontinuity, the idea that service innovation should correspond to a significant shift, i.e. a long-run change and that is different from continuous adaptation to small changes seems largely shared in the relevant literature, as we have already discussed (Sundbo, 1997; Weinstein & Gallouj, 1997; Drejer, 2004). However, these studies have not solved the problem to identify which elements or components affected by change in the overall service innovation process have to be univocally considered in assessing replicability, discontinuity and performances. Furthermore, although service scholars in the innovation tradition have recognized that a number of relationships exist between and among the different service innovation dimensions, the nature of such relationships as well as of

the underlying mechanisms that explain these relationships have remained substantially unexplored.

With specific regard to the nature of innovation processes in service contexts, the majority of studies are those related to the New Service Development (NSD) research stream (e.g. Easingwood, 1986; Scheuing & Johnson, 1989; de Brentani, 1993; Edgett, 1996, Edvardsson & Olsson,1996). A number of different research topics have been investigated under the umbrella of NSD (Papastathopoulou & Hultink, 2012), although the interested has gradually moved from critical success factors and performance measurement (e.g. de Brentani, 1993; Ottenbacher, Gnoth, & Jones, 2006) toward a broader agenda, including especially customer involvement (e.g. Matthing, Sandén & Edvardsson, 2004; Kristensson, Matthing & Johansson, 2008) and organizing for NSD (e.g. Vermeleun & Van der Aa, 2003; Frohele & Roth, 2007; Zomerdijk & Voss, 2011). Surprisingly, little attention has been devoted to the elements of the offering that are object of the development activities and, hence, the "organization" as a specific dimension of the service innovation process has largely remained neglected. Differently from manufacturing, the service offerings is a combination of physical elements, processes, skills and materials, namely a bundle of interconnected material, intellectual and organizational resources (Frohele & Roth, 2007) that are subject to organizational change during the service innovation process and, accordingly, should require careful investigation. Unfortunately, previous literature on organizing the innovation process in service contexts have addressed organizational change issues according to a structuralist perspective of innovation (Slappendel, 1996) and adopted a variance-based approach (Mohr, 1982). Indeed, in these studies the innovation process is mainly depicted as formalized, strategically designed, following a linear stage-based development model and only focuses on innovations in final service offerings (e.g. Edvardsson & Olsen, 1996; Scheuing & Johnson, 1989). Accordingly, efforts have been mainly devoted to understand which organizational conditions (i.e. combination of structures, procedures, management systems, etc.) or dynamic capabilities can ensure better innovative performance during the different stages of the innovation process (den Hertog. et al., 2010; Froehle & Roth, 2007; Sundbo, 1996).

More recently, similarly to what already happened in manufacturing (e.g. Eisenhardt e Tabrizi, 1995; Moorman e Miner, 1998; MacCormack & Verganti 2003), a recent

turn in service innovation studies has documented the adoption of an interactive, contingent and improvisational view of the service development process (e.g., Edvardsson & Haglund, 1995; Johnson et. alia, 2000). Furthermore, some empirical studies have shown that instead of formalized processes, the development of new service offerings follows a "practice-driven model" (Toivonen & Tuominen, 2009), since innovation is not formalized or strategically planned but, on the contrary, is an emergent phenomenon, highly integrated in everyday operations and often in interaction with customers (Crevani, Palm, & Schilling, 2011; Dolfsma, 2004; Toivonen & Tuominen, 2009). These studies reveal the need of further research at the micro-level, focused on daily operations in an organization or a network as well as the adoption of suitable approaches (such as ethnography, in-depth interviews or action research) in order to understand the complexity and situatedness of the process through which innovation emerge and develop in service contexts (Crevani et al., 2011). In answer to such a research call, in the next paragraph we would show the advantages of conceptualize service innovation through the concept of organizational routines as well as the potential to advance empirical research on service innovation processes through embracing a practice-based perspective (Orlikowski, 2000; Feldman & Orlikowski, 2012).

2.3. Conceptualizing service innovation: an organizational routine-based perspective

2.3.1. The new definition and related benefits

We propose to conceptualize service innovation as "a change in intra-firm and inter-firm delivery routines that have stabilized in a new configuration". Within relevant literature, at least three definitions are available of organizational routines (Becker, 2004; Becker & Zirpoli, 2008):

- Routines as cognitive regularities or cognitive patterns (e.g. March & Simon, 1958; Cyert & March, 1963; Cohen 1991);
- Routines as recurrent interaction patterns for accomplishing tasks (Cohen et al., 1996; Feldman & Pentland, 2003; Pentland & Rueter, 1994);
- Routines as dispositions to engage in previously adopted or acquired behavior triggered by an appropriate stimulus or context (Hodgson & Knudsen, 2004; Hodgson, 2008).

In our argument, we expressly consider organizational routines as "recurrent interaction patterns" for accomplishing tasks (Cohen et al., 1996; Feldman & Pentland, 2003; Pentland & Rueter, 1994). According to this view routines are actions, acts, performances and processes actually carried out in organizations and as such they share the same ontological nature of services. The expression 'recurrent interaction patterns' provides a more precise term for referring to stability on the level of behavior that involves multiple actors (Becker & Zirpoli, 2008).

A number of benefits are directly associated to the new proposed definition of service innovation. First of all, setting organizational (and inter-organizational) delivery routines as the unambiguous unit of analysis to assess service innovation is consistent with its multi-dimensional nature. In fact, although any change in one or more dimensions of a complex service innovation system could potentially represents a true innovation, this actually happens only when such a recombination of service components results in a new way of accomplishing tasks, i.e. a new set of delivery routines. This leads us to claim that the new definition of service innovation is able to incorporate the interdependencies existing between changes in different technological and not technological components, chiefly organizational change, of a complex innovation service system, with organizational routines actually working as a valuable unifying lens.

An organization routine-based conceptualization of service innovation is also faithful to a Schumpeterian perspective, since it simultaneously fulfils the apparently opposing requirements of replicability and discontinuity and along with keeping the economic meaning of innovation. As "repetitive interaction patterns" organizational routines constitute stable entities and stability ensures that service innovation does not consist of specific, non-reproducible solution to a specific problem, but, conversely, results in a new stable and replicable delivery configuration (in terms of processes, systems and performance). At the same time, referring to routines for assessing the intensity of the realized change, we can precisely establish if it corresponds to a significant shift and interruption of an old routine system, resulting in a radical or incrementally new configuration, so distinguishing it from learning and competence development (Gallouj & Weinstein, 1997; Sundbo, 1997). Furthermore, in management studies the close link existing between routines and

performance has been recently made explicit (Becker, 2005; Becker & Zirpoli, 2008; Pavlov & Bourne, 2011). This leads us to show how a routine-based perspective can be profitably used to establish if service innovation represents a new business opportunity through assessing its real economic impact.

Finally, studying service innovation through the lens of organizational routines leads the way for understanding how the service innovation process develops according to an interactive model in which planning and emergence are highly intertwined. The concept of organizational routines has been employed in the empirical research as a lens to understand organizational change processes as they occur in daily routines and operations (Becker et al., 2005), by exploring the complex interactions between deliberate managerial influence and endogenously induced change, mainly due to human actors involved in carrying out routines (Feldman, 2000; Feldman & Pentland, 2003). In this respect, notwithstanding the attempts of distinguishing organizational innovation from organizational change by depicting the first as the result of strategic managerial decisions, we believe that a separate investigation of deliberate and emergent aspects of change is not fruitful in a process theory of service innovation. This is especially true in light of the increasing importance attached in the academic community and among practitioners to a practice-driven model of innovation (Crevani et. al. 2011; Toivonen & Tuominen, 2009). Embracing an "interactive perspective" on innovation (Slappendel, 1996) and a "practice lens" focused on daily practices and routines (Orlikowski, 2000) innovation in service organizations is investigated as a complex "structuration process" (Giddens, 1984) characterized by interactions between deliberate and emergent changes in inter-firm and cross-firm delivery routines and in other components of the whole service innovation system. Framing service innovation through the concept of organizational routine seems to provide a powerful analytical lens to understand the underlying mechanisms shaping such complex interaction. In the next paragraph we will show the historical foundations of our theoretical assumption regarding the nature of service innovation. More specifically, we will discuss the common ontology of services and routines and show how such an aspect is probably at the roots of their similar development paths in the relevant research streams.

2.3.2. The common ontology of services and routines

The interactive and process nature of services and routines

Within service marketing and management traditions, a number of key characteristics has been largely adopted in describing services, so as to distinguish them from traditional manufacturing goods (Zeithmal & Bitner, 2000). However, the so-called IHIP characteristic-based approach embraced to simultaneously express the intangibility, heterogeneity, inseparability of production from consumption and perishability of services has been subsequently criticized and the distinction between manufacturing and service firms has remained substantially not clear-cutting (Vargo & Lush, 2004). Although no single and comprehensive definition of service is capable of capturing their complexity and variety (Cook et. alia, 1999; Lovelock and Gummesson 2004) a general agreement seems to prevail with regard to the key distinctive characteristics of services, i.e. their interactive and processual nature (Edvardsson et. alia, 2005). Instead of things or material objects, services have been widely conceptualized as acts, deeds, actions, interactions, processes, activities, performances or experiences (Rathmell, 1966; Berry, 1980; Lovelock, 1983; Solomon et. alia, 1985; Gronroos, 1990; 1998; Kotler, 1994; Zeithaml & Bitner, 1996; Gadrey et. alia, 1995; Pine & Gilmore, 1999, Vargo & Lusch, 2004). For example, Gronroos' (1990) definition , "an activity or series of activities of more or less intangible nature that normally, but not necessarily, take place in interactions between the customer and service employees and/or physical resources and/or systems of the service provider which are provided as solutions for customer problems", through describing services as activities and interactions clearly enhance core features of services not directly applicable to physical products (Edvardsson et. alia, 2005). Furthermore, the traditional literature on services has also emphasized the attribute "organizational" when describing the nature of service interactions. According to Gadrey et. al (1995), " to produce a service is to organize a solution to a problem (a treatment, an operation)…. It is to place a bundle of capabilities and competences (human, technological, organizational) at the disposal of a client and to organize a solution". The definition emphasizes the key role of the organization and put the organizing of resources and capabilities at the core of any service offering. As for organizational routines, their interactive nature has been explicitly captured in their classical conception as "recurrent interaction patterns" (Becker, 2004; 2005; Cohen & Bacdayan, 2004; Pentland & Rueter, 1994; Feldman & Rafaeli, 2002;

Becker & Zirpoli, 2008). In these studies, "interaction" is seen as a subset of "action" referring to such action that involves multiple actors and as such it serve to establish a difference between the individual and collective level (Becker, 2004). Indeed, the concept of habit has been usually adopted rather than routines to refer to the recurrent patterns occurring on the individual level (Hodgson & Knudsen, 2004; Hodgson, 2008).

As for actors involved in interactions, the customer has been traditionally considered as a key "interactor" in the production of services since he provides essential inputs in the co-production process (Sampson & Froehle, 2006). Although emphasis has been traditionally given to interaction with customer, front line and back-office employees also play a similar role. Furthermore, even though back-office or supporting processes, do not require the direct involvement of end users, the internal interaction between front-office and back-office workers still characterize these sub-processes. If the focus on actual firm-customer interactions (the so called service encounters) and their behavioural implications has largely informed the service marketing literature (Bitner, 1990), service operations management researchers have tend to consider the content and level of interaction with customers as a key dimension for classifying services and designing efficient service processes (e.g. Chase, 1981; Silvestro, 1992; Kellog & Nie, 1995). More recently, service innovation research have recognised the importance to explicitly address, next to interactions with customers, also those involving a variety of external actors, and specifically other suppliers, who provide production inputs or co-produce service packages, and policy makers (Windrum & Garçia-Goni, 2008). The above discussion suggests us that when addressing interactivity in service processes, it should more appropriately encompass many kind of interactions, i.e. all those realized among human agents internally and externally to the service firm. Through relying on a broader perspective, the interactive dimension of services is consistent with that traditionally attached to routines. In fact, interaction is the mechanism by which multiple actors, potentially located in different places and geographical areas, both within and across an organization, are linked together in carrying out a routine (Becker, 2004). A number of empirical studies have studied routines as collective entities involving actors within a specific unit or organization (e.g. Pentland & Rueter, 1994; Feldman 2000; Howard-Grenwille, 2005), whereas the concept of "inter-organizational routines" has been employed, although to a narrow extent, to

explore routines carried out across organizational boundaries (e.g. Delmestri, 1998; Zollo, Reuer & Singh, 2002).

The processual nature of service is the only aspect that clearly distinguishes them from physical goods (Grönroos & Gummesson, 1985). Processes are viewed as the raw material used to construct services (Shostack 1987) and services exist only while being rendered to end customers. They emerge in 'open' processes where the customers participate as co-producers and hence can be directly influenced by the progress of these processes (Grönroos, 2006). Indeed, within the service marketing literature the high importance attached to observational methods in order to examine service interactions as they occur (e.g. Bitner, Booms, & Tetreault 1990; Echeverri, 2005) is justified by the need to capture the processual nature of service phenomena (Grove & Fisk, 1992). Similarly, organizational literature has widely recognized that organizational routines are unit of analysis that have a processual nature (Pentland & Rueter, 1994; Pentland, 1995; Becker, 2004).

As for processual dimensions, within operations management literature, a number of process-related dimensions (such as degree of customization, degree of discretion, level of organizational flexibility, degree of automation) have been mainly adopted within service classification schemes (Silvestro, 1999; Kellog & Nie, 1995; Collier & Meyer, 1998; Wemmerloev, 1990; Buzacott, 2000; Zomerdijk & de Vries, 2007) with the aim to identify a set of design characteristics for different types of service systems (Ponsignon, Smart & Maull, 2011). However, probably because of the classifying scope of these works, the identified processual dimensions seem mainly refer to the broader service systems rather than to the service process in itself, encompassing characteristics of technology, layout, equipment, human resource management, capacity strategy and even performance targets. Among the listed dimensions, the degree of routinization (Wemmerloev, 1990) and the degree of repeatability of the service encounter activity sequences (Collier & Meyer, 1998) enable us to conceptually put services really close to routines. The first dimension, used to distinguish between rigid and fluid service processes, is referred to the level of task variety (Vemmerloev, 1990: 31) whereas the second refers to the frequency that a specific service encounter activity sequence is duplicated from one customer to another (Collier & Meyer, 1998: 1232). Management can limit the degree of repeatability through service system design and choosing the number of pathways routes offered to the customer to select and configure their activity sequences. As for

organizational routines a large number of dimensions (such as time lags and delays, speed of execution, frequency of repetition, duration, employee turnover) has been adopted in organization theory and empirical research in order to describe the processual characteristics of routines (Becker, 2004). Representing them through grammar models, Pentland (2003) suggest "lexical size" and "sequential variety" as specific process dimensions to assess the routineness of tasks. Lexical size refers to the overall number of action steps constituting the grammar for representing routines, whereas sequential variety refers to the number of different combinations of steps to carry on the same task (or routine). Finally, frequency of repetitions, defined by the measure of how often the same interaction pattern has been repeated in one time period, can be used to assess the repetitiveness of specific organizational routines (Becker, 2005). It is worth highlighting that sequential variety shifts the focus from the content of activity (i.e. content variety) of task units (that substantially is equivalent to tasks variety as described for services) to the variety in the sequences of steps in which the task is carried out (that overlaps with the repeatability dimension used to describe service encounter activity sequences). From our discussion, we can conclude that in exploring the processual nature of services, traditional research can benefit from more recent insights in organizational literature through integrating the more broad dimensions used to describe the service system structure (of which service processes are considered as a subcomponent) with the more accurate dimensions used to measure organizational routine characteristics, mainly lexicon size, sequential variety and frequency of interactions.

In summary, our argument in equivalent to that recently sustained by Pentland, Yakura & Singh (2011): "…for any service to be rendered, some pattern of action must have taken place. Thus, at the level of action, services share a common ontological foundation with processes and routines. Like processes or routines, services are composed of recognizable, repetitive patterns of interdependent actions" (pag.2-3).

Common and contrariwise trade-offs: services as routines and routines as services
In the previous section we analyzed the common ontology of services and routines as units of analysis that are interactive and processual in nature. However, we have hitherto neglected the most important characteristic that organizational literature

have attributed to routines, defining them as "repetitive" interaction patterns. Ontologically speaking, repetition seemingly push away routines from services: on the one hand, services have been widely depicted as heterogeneous objects and service processes as variable (i.e. changeable) because of customer participation and heterogeneity in production inputs (Chase, 1978; Lovelock & Young, 1979; Grönroos, 1990; Sampson & Froehle, 2006); conversely, organizational routines have been unanimously identified as recurring or repetitive entities (Cohen et al., 1996; Pentland & Rueter, 1994; Becker, 2004) and routine processes usually conceptualized as fix and unchanging objects (Feldman & Pentland, 2003). In fact, in both research traditions we assisted - respectively for services and routines - to an important reconceptualization that, through moving in a contrariwise direction, has contributed to make services more similar to routines and routines more similar to services.

Within service marketing and operations research, scholars have focused on heterogeneity (or variability or non-standardization) of services to indicate the difficulty of achieving uniform output (Lovelock & Gumesson, 2004). Units of service production tend to be heterogeneous due to both employee-induced variation (Sasser, Olsen, & Wyckoff, 1978; Levitt, 1972) and customer-induced variation (Eiglier & Langeard, 1977; Mills & Morris, 1986; Zeithaml & Bitner, 2000). Customers change in terms of needs or expectations (Zeithmal & Bitner, 2000) but they can also be influenced by the behaviour of other customers during service delivery (Desmet, Van Looy, & Dierdonck, 1998). However, this traditional characterization of services as variable entities has been subsequently criticized by more recent service research (e.g. Lovelock & Gummesson, 2004; Vargo & Lush, 2004; Edvardsson, Gustafsson & Roos, 2005). As underlined by Vargo & Lush (2004: 328), at least parts of many services are standardized and homogenized (e.g. airline transportation, medical producers, information provision). Indeed, the level of standardization (or customization) has been a key dimension for many service classification schemes, taxonomies and positioning matrixes (Maister & Lovelock, 1982; Lovelock, 1983; Schmenner, 1986; Haywood-Fanner, 1988; Bowen, 1990; Silvestro et al., 1990; Wermellov, 1990; Kellog & Nie, 1995). Lovelock (1983), for example, considers as highly standardized those services with a combination of a low degree of customization of the service (and its delivery system) and a low extent to which contact personnel exercise judgment in meeting individual customer needs

(e.g. public transport, routine appliance repair and fast food restaurants). Actually, only services constituting physical acts to customers' bodies (like healthcare services, lodging or beauty salons) are often hard to standardize because of direct labour and customer involvement, whereas for all other service categories some exceptions always exist and at least parts of these services can be potentially standardized (Lovelock & Gummesson, 2004). Accordingly, heterogeneity should not be consider as a definitional characteristic of services.

In any case and especially for labour-intensive services, the problem of reducing, controlling or eliminating existing variability still remained a key challenge for service design and operations since it is viewed as something negative in terms of both efficiency and efficacy. This is particularly true when variability is induced by customer participation in the service delivery; indeed, when production inputs provided by customers have poor quality this can cause bottlenecks, additional costs and inefficiency (e.g. Mills & Moberg, 1990; Zeithaml & Bitmer, 2000). Operation management and marketing scholars have suggested a number of strategies to reduce variability (Northcraft & Chase, 1985; Lovelock, 1983; Chase, 1978; Collier & Meyer, 1998; Frei, 2006), such as mechanization or automation of service processes (Northcraft & Chase, 1985) or standardization of service delivery through reducing customer contacts (Lovelock, 1983), the range of service offerings (Chase, 1978) or the number of routes that customers can take during service delivery (Collier & Meyer, 1998). However, although automation and standardization may provide efficiency and control, this can come at the expense of effectiveness. As a consequence, standardization and customization has become one of the biggest dilemma for a number of service firms (Sundbo, 2002). In this respect, mass customization and modularization in services have been recently presented as possible solutions to such a dilemma (Voss & Hsuan, 2009; Gawer, 2009; Pekkarinen & Ulkuniemi, 2008; Kannan & Proença, 2010; Kannan & Healy, 2011). Although rooted in different research traditions or based on different approaches, all these solutions point to the goals of reducing the variability that the firm has to manage (so ensuring higher efficiency and control) while enhancing the variations that customers perceive in experiencing services, i.e. capitalizing on the flexibility of service provision to meets the heterogeneous standards of consumers (Vargo & Lush, 2004). Recognized that services cannot be conceptualized as a variable entity in absolute terms neither that service standardization is to pursue at all costs sacrificing

customization, the re-conceptualization of routines as a flexible and changeable object can help to reflect about the endogenous power of adaptation and change (i.e. variability) inherent in routine (i.e. standardized) service processes as well as to which dimensions of the service system the management can act in order to manage service variability.

Within organizational literature, a number of empirical studies (e.g. Pentland & Rueter, 1994; Miner, 1991; Feldman, 2000; Narduzzo, Rocco & Warglien, 2000; Edmonson, Boher & Pisano, 2001; Howard-Grenwille, 2005) have showed that organizational routines, i.e. repetitive interaction patterns actually performed by multiple actors in a given time and space (Pentland and Rueter, 1994; Cohen et al., 1996; Feldman & Pentland, 2003), are not static and inflexible entities as the adjective "repetitive" could deceptively suggests but, conversely, can be a source of flexibility, change and variability. Pentland & Rueters (1994) conceptualize routines as "effortful accomplishments" to indicate that although a given task unit can exhibits repetitive, functionally similarly patterns of action in response to defined stimuli, each instance is, to a greater or lesser extent, the result of a mindful and deliberate effort made by participants during their interactions. According to the authors, even when an activity is considered "routinized", because the degree of choice has been reduced through establishing fix responses to defined stimuli (March & Simon, 1958), the patterns that emerge through interactions are not fixed because organizational participants have a repertoire of actions they can take. "What is fixed, to some extent, is the space of possibilities for action (although that too can change, with sufficient effort)" (Pentland & Rueters, 1994: 491). The empirical case reported in their study actually concerns service interactions (technical assistance to customers in using a software product) and the example of fast foods is used in their work to highlight that even the most routinized kinds of service encounters exhibit a considerable amount of variety and require effort to participants (pag. 488). In a later work, Pentland (2003) explains that the apparent contradiction (i.e. routinized tasks performing high variability) derives from the traditional indicators used to measure task variety, that are more indicative of variations in the content of work ("content variety") and not in the pattern of actions used to accomplish it ("sequential variety"). Service encounters interactions related to a hiring routine are also empirically investigated in Feldman (2000) to show how a routine with standard features can change not because of changes in its constituting elements but rather in

how they are accomplished. The analysis reveals that change can derive not only from choosing from a repertoire of possible actions, as Pentland & Rueter (1994) have suggested, but also from changes in the repertoire itself and the rules that govern choice. Human agency, through reflections and reactions to outcomes of previous iterations, is what makes organizational routines an emergent and ongoing accomplishment. Participants can introduce variations also in working environments where practice is rigidly prescribed by formal procedures (Narduzzo et al., 2000) and decide to undertake adjustments and improvisations in order to make the routine work (Miner, 1991). Indeed, in the face of high variability routines can remain the same, persisting more or less unchanged over time (Howard-Grenwille, 2005).

"Script" as a key concept for both services and routines

Both services and routines ground their roots in the concept of "script" . Indeed, the term has been largely adopted in service marketing and management and caused quite an echo in the development of routine theory. As a consequence, we can infer about the similar ontology shared by service and routines through tracing how the concept has been exploited in both literature traditions. Indeed, starting both from script theory as developed in cognitive psychology, social psychology and organizational behaviour (Abelson, 1981; Lord & Kernam, 1984; Gioia & Poole, 1984; Ashforth & Fried, 1988) the two literature traditions have developed almost independently of each other, substantially inspired by different goals. However, a true potential of integration and cross-fertilization actually exists and we seriously argue that it should be exploited.

Defining a script as a form of schema embodying knowledge of stereotyped event structures, Abelson (1981) applied the concept in cognitive psychology and social psychology. Indeed, in his work, a number of service settings including retail stores, restaurants and air travels were used as examples of work environments where scripted were commonly used in employee-customer interactions. A similar meaning was also attached to the term by Gioia and Poole (1984), who consider scripts as serving the function of planning and executing repetitive or familiar behaviours. Drawing on scheme theory, control theory and goal setting theory, Lord & Kernam (1984) discuss how script-type structures are used not only to interpret, organizing or store incoming information but also to guide the output of purposeful behaviour. In their work (1988), Ashforth and Fried offer a detailed theoretical discussion about

the nature, functions and development of scripts as well as their applications in organizational behaviour. Scripts or event schemas are conceived as "cognitive structure that specifies a typical sequence of occurrences in a given situation" (p. 306). As such, they contain a temporal ordering, are cued by stimuli originating in the task environment or by the individual and are arranged in a hierarchical order. Scripts are developed as the individuals gain experience with relatively invariant tasks and role-based behaviours through organizational socialization, on-the-job experience and symbolic management and scripted behaviour is argued to be pervasive in mindless organizational behaviour. Scripts serve as number of positive functions (such as saving cognitive capacity, legitimating organizational activities, and facilitating sense making, prediction and control) but at the same time can be dysfunctional through inducing less vigilance and authenticity in operations routines, blinkering perceptions premature closure and superstitious learning in decision making.

Tracing the use of the term "script" in service marketing and management literature (e.g. Ahsford & Ravid, 1986; Tansik & Smith, 1991; Harris, Harris & Barton, 2003) it has been predominantly associated to mindless behaviour and adopted as a synonym of "performance programs" (March & Simon, 1958) i.e repetitive operating routine triggered by some environmental stimulus, that once triggered, runs to its logical conclusion with little or no real problem-solving and conscious deliberation on the part of the operator (Ashford & Ravid, 1986:166). Through examining customer interactions in service bureaucracy settings (i.e. individuals entering of phoning and asking a question or requesting a service) Ashford and Ravid (1986) investigate how mindless behaviour on the part of the service firm' employees, generally seen as a source of efficient functioning, can also be a cause of poor service in some specific circumstances. Mainly drawing on previous work and especially on Ashford and Fried (1988), Tansik & Smith (1991) discuss the use of script as a job design tool and argue that job scripting can be a powerful and effective weapon for management since it enable them to control over employee-customer interactions and assure them that workers actions are made according to their prescriptions and expectations. However, they also claim that the management need to balance the efficiency associated with mindless, habitual behaviour based on extensive scripting and the need to be sensitive to environmental cues. To this end, a number of dimensions that are relevant in script development (i.e. script complexity,

script intensity, number of scripts in a job, percentage of work time spent in scripts and percentage of job duties encompassed in scripts) are identified and used to describe, in normative terms, how the level of customer-induced uncertainty influence the nature of scripts that are more appropriate in a variety of service settings. In general, scripts with high complexity and low intensity, a larger number of scripts but a lower percentage of total scripted duties and total work time spent in scripted behaviour will be associated to work settings with high customer-induced uncertainty. A recent study conducted in the hospitality industry seems to confirm the validity of such a model (Victorino, Velma & Wardel, 2008). Indeed, through testing the effects that scripts have on the perceptions of service quality in two types of service interactions, i.e. a standardized encounter (check-in) and a customized encounter (i.e., concierge service), the study suggests that hotel managers should be circumspect in scripting customized encounters (i.e. with high customer-induced uncertainly) but may apply them to standardized services without diminishing customers' perception of service quality.

The concept of script is discussed in relation to participants' expectations in the service encounter interactions in the works of Hubbert, Sehorn and Brown (1995) and Eichentopf, Kleinaltenkamp and Stiphout (2011) Indeed, during the repetitive service interaction each participant both the service provider and the customers develop expectations about their actions and the actions of other participants and this overall expectations forms the script they use (Eichentopf et al., 2011). The potential existence of a misalignment between their respective sub-goals can result in customer-perceived gaps in the service and in service quality (Hubbert et. al., 1995) and this means that managers need to focus on customer-provided scripts as a complementary design tool to service mapping and blueprinting (Shostack, 1984; Kingman-Brundage, 1991; Fließ and Kleinaltenkamp, 2004). Empirical research has shown that scripts have a positive impact on customer satisfaction and value creation since both factors are driven by customer influence and control of the process itself (Frahendorf, 2006). Similarly to what happens for employees, the service script works as a guiding pattern for the client and gives him instructions about how much participation the service situation necessitates and what actions to perform (Frauendorf, 2006, p. 114). However, since a company has only limited power over customers and the difficulty of transferring the implicit script knowledge of the

customer it should integrate the customer already participating in the development of the new service process.

As adopted in the mentioned studies, the concept of script corresponds to a functionalist perspective and, indeed, "functional scripts" are widely adopted in training programs within service organizations. In more recent studies on service marketing and management, such an interpretation has been contrasted to that embodied in the concept of "dramatic script" (es. Harris et al., 2003; Gross & Pullman, 2012). The conceptual shift can be explained by the increasing use of the theatrical metaphor (Grove & Fisk, 1983; Goodwin, 1996), role theory (Solomon et al., 1985) and experience design concepts (Pine & Gilmore, 1999; Schmitt, 1999) in service research (e.g. Bitner, Booms, & Mohr, 1994; John, 1996; Broderik, 1998; Carbone & Haeckel, 1994; Harris et al., 2003; Pullman & Gross, 2004). Differently from a functional script, viewed as a "topdown" simplistic structure that leaves little room for the employees' individuality or emotional interpretation, the dramatic script is a complex entity that encodes the holistic experience and enables employees to sensitize themselves to customer's needs, experiment with different roles contained within the company playscript and using improvisation techniques to extend their individual role repertoires as well as develop schemas for difficult or unexpected situations (Harris et al., 2003:196). As such, it can provide large benefits to managers and can be applied to every kind of human interactions, regardless of the specific work setting in question. To synthesize, we can deduce that within service marketing and management literature, scholars have gradually recognized the need to enrich script theory in order to include concepts such as deliberation, experimentation and adaptation on the part of actors involved in service interaction patterns.

Within literature on organizational routines, Barley's work (1986) is one of the first study that empirically adopts the "script" construct in order to to show how identical technologies may occasion processes that lead to different scripts and, hence, to different organizational structures in different settings. To Barley, the notion of script acts as a link between the institutional real with the realm of action, since it mediates both flows of reciprocal influence. "Actors' identities are replaced by the positions they play, their behaviors and speech are reduced to generic form and content, and the action's unfolding is charted as a sequence of turns composed of typical acts" (pag. 83). In the author's conceptualization, script are viewed as "the behavioral grammar that informs everyday action", representing standard plots of types of

encounters that are abstracted from details of actual behavior and speech. We can deduce that, differently from the meaning predominantly attached to the term in service research, the construct is not viewed as a job design tool used by management to simplify and control behavior in organizations but is rather used to express the underlying behavioral structure of recurrent interaction patterns. Rather than treating scripts as mental models, plans or cognitive schema (Schank & Ableson, 1977), scripts are described as "observable, recurrent activities and pattern of interaction characteristic of a particular setting" (Barley & Tolbert, 1996: 98). As behavioral regularities, scripts can be empirically identified, regardless of actor or level of analysis considered and as such they constitute a useful tool to study how institutions and actions are linked. In fact, since scripts encode institutional principles people can more or less consciously choose to enact or ignore them, so leading to reproduce or change an institution.

The concept of "script" as cognitive structures of individual organizational members (Ashforth & Fried, 1988) is resumed in Pentland and Rueter's (1994) work about organizational routines. Here, the original argument about scripted or mindless behavior as a commonplace in operating routines is considered analogue to that of March & Simon (1958) and, accordingly, "scripts" are viewed equivalent to "performance programs". In their argument Pentland and Rueter (1994) refuse the concept of routines as automatic responses and repetitive behavior carrier out in a mindless way. On the contrary, they agree with Giddens' view (1984:86) that most routinized behavior has to be "worked out" continually by those who sustain it in their day-to-day conduct. In order to reconcile the apparently conflicting perspective on routinized social action, they propose an integrated model based on the concept of organizational routines as a grammar of action. Organizational routines are conceptualized as the underlying structure that can be captured in the rules of a grammar and although observed performances are apparently non routines because are quite diverse, they embody a repetitive, functionally similar pattern of action. The use of grammatical models enable authors to recognize that organizational routines (i.e. observed interaction patterns) are constrained and enables by scripts (the underlying structure) but at the same time to acknowledge a key role to the individual effort and agency that gives rise to the particular (and unique) patterns observed. We can easily noticed that, through relying on the grammar language, the resulting meaning attached to "scripts" tend to overlap with their conceptualization

previously provided by Barley (1986). In a later paper, Feldman and Pentland (2003) propose a new conceptualization of organizational routines, arguing that they consist of two mutually constitutive aspects, i.e. the ostensive and the performative. The ostensive aspect is the abstract, generalized idea of the routine (the routine in principle) while the performative aspect consists of specific actions, taken by specific people in specific circumstances, place and times (the routine in practice). According to the authors, the ostensive aspect of a routine may be thought of as a narrative, or a script (Pentland & Feldman, 2005) since it serve as a template for behavior or as a normative goal and comprise individuals' cognitive understanding of the process. However, it can only guide, without specifying the details of each performance, that remain a choice of human agency. Furthermore, it does not simply guide performance as a script guide a play, but is also created from the performance. In fact, the ostensive aspect of a routine is maintained by the act of repeatedly performing it and, like the script of a play, if no one choose to read the script, the capability to do so vanishes. Through relying this new conceptualization, organizational routines, when considered as scripts for behavior (i.e. in their ostensive dimension), are not conceptualized as a static, inflexible and unchangeable entity, since human agents can always exert reflexive self-monitoring and deliberation and hence be a source of endogenous change in the underlying structure of a routine (Feldman & Pentland, 2003). According to the new conceptualization, the ostensive script is not a "scripted set of behavior" (Levinthal & Rerup, 2006) like a standard operating procedure, because it incorporates the subjective understandings of diverse participants and it is hence distributed unevenly (Feldman & Pentland, 2003).

Within the strategic literature on the replication of routines (Winter & Szulanski, 2001; Szulanski & Jensen, 2004) the concept of "script" has been considered as a synonym of "template". To Szulanski and Jensen (2004) the scripts described by Barley (1986) are interpreted as specialized templates that serve to maintain the institutional structure so that a direct correspondence exists between features of the organizational structure and those of the underlying scripts. Within the replication process, a template (or script), that is the best practice program being replicated, serves as a benchmark or referent and is a tangible, currently in existence behavioral manifestation that occurs with regularity (pag. 352). This means that, viewed as an

entity separated by their actual action patterns, the template has no value in replication initiatives.

2.4. Linking classical service innovation dimensions with changes in organizational routines

Literature on service innovation has not sufficiently neither systematically explored the nature of relations existing between the various dimensions classically adopted to analyze innovation in service contexts. In the previous sections we built the foundations for a new conceptualization of service innovation and discussed the theoretical and analytical advantages inherent to a new organizational routine-based definition. To this stage, we need to understand how changes in organizational routines that result from a service innovation process can be related to changes that occur in other classical service innovation dimensions. Since a number of different components, vectors or dimensions have been proposed in literature within various analytical frameworks (e.g. den Hertog, 2000; Gallouj & Weinstein, 199), we would limit our analysis to the most relevant dimensions, also considering that there is a substantial overlap in those described in different models. For analytical purposes, we chose to draw on two conceptual frameworks. The first was proposed by Bullinger, Fähnrich & Meiren (2003) in the attempt to systematize the development of services. According to the authors, a service can be said to be characterized by three different dimensions: i) a structural dimensions (that determines the ability and willingness to deliver the service in question; ii) a process dimension (the service is performed on with the integration of external factors in the processes of production and delivery); iii) an outcome dimensions (that indicate the material and immaterial impacts principally for external factors, namely what a service actually does for them). The last conceptual framework is that elaborated by Goldestein et al. (2002), that, substantially enable us to: i) break down the structural dimension in its strategic component (i.e. the service strategy of what to deliver namely the market position and type of customer relationships that in our model is included in the vector of preferences) and its operational one, i.e. how that strategy should be implemented starting from a number of production inputs (i.e. people, technologies, processes, physical facilities and equipment); ii) include performance measures, such as financial (revenues, cost, profit, return on investment); operational (number of transaction per day, average time per transaction) to marketing (customer

satisfaction). Together, the models enable us to consider an important service innovation dimension, that is, the service concept as an holistic picture of the service offering, that requires the specification of structural, process and outcome models (Bullinger et al., 2003) and acting as the link between the what and how of the service, i.e. as an "integrative element between an organization's business strategy and delivery of its service products" (Goldstein et al., 2002:126). As reported in figure 1, the classical service innovation dimensions are included in the realms of structure and outcome whereas the changes in the actual interaction patterns enacted during the service delivery are attributed the process/action realm. As for the service concept, differently from Gallouj & Toivonen (2011), we do not simply view it as a dimension of the technical characteristics vector, but as proposed by Menor & Roth (2003) distinguish between the "intended" service concept (as a dimension of the structure realm) and the "enacted" service concept (as a dimension of the outcome real).

Figure 1: Relationships between service innovation dimensions

31
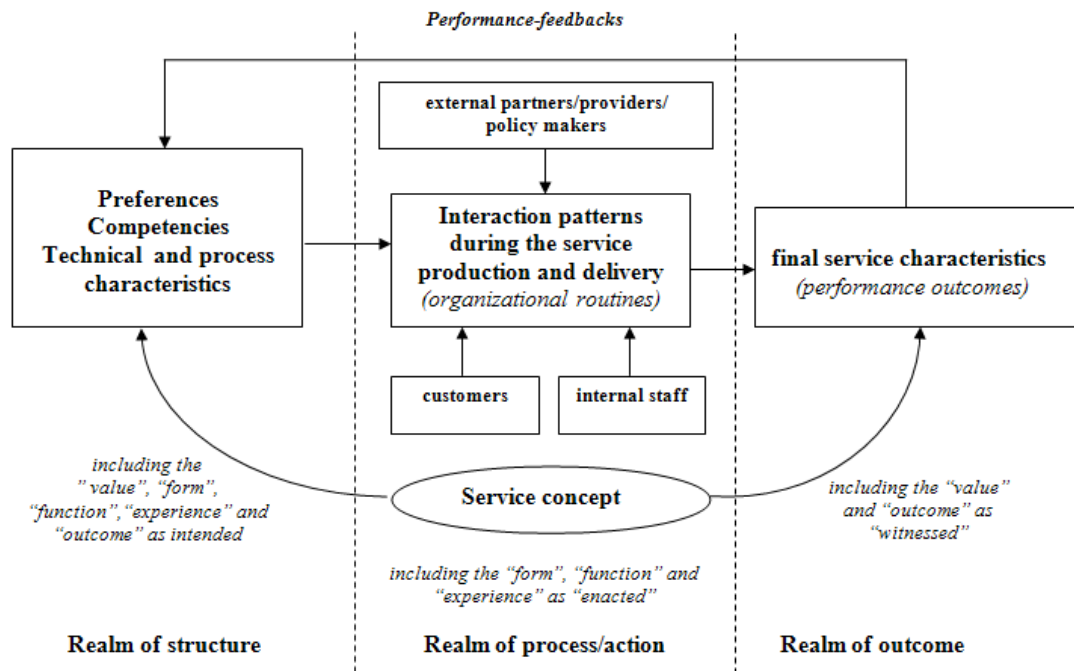
2.4.1. Relationships between changes in preferences and service delivery routines

Preferences of agents involved in the service innovation process were firstly added as a key dimension to the original "characteristic-based model" (Weinstein & Galloiuj, 1997) by Windrum & Garçia-Goñi (2008) in order to explore how the complex interactions between service providers, patients and policy makers determine the timing, direction and success of innovation adoptions in public hospitals. According to the authors, agents (i.e. the service provider, the users and policy makers) have their own set of preferences that reflect mental models and the relative payoffs that they attribute to alternative choices and actions and, accordingly, their goals, needs and expectations with regard to the final characteristics of the service in question[1]. The respective sets of preferences of agents in the innovation network are not necessarily aligned and, consequently, the existence of divergence can cause them to be involved in actions of power, influence, re-alignment and conflict resolutions (see Josh & Zirpoli, 2010). We argue that, in the context of service innovation, the distinct sets of preferences owned by agents involved - not only the service providers and customers but also external partners, business providers and policy makers - can be viewed as a basic component of the service concept. Indeed, both within service marketing and operations management (e.g. Heskett, 1986; Lovelock & Wright, 1999; Edvardsson & Olssen, 1996; Clark, Johnston & Shulver, 2000; Goldstein et al., 2002; Roth & Menor, 2003), a variety of attributes used to describe it along with terms adopted to clarify its meaning suggest the reference to an underlying structure of preferences and expectations and the potential for mismatch between them. In describing the service concept, for example, Heskett (1986:16), refers to " the way in which an organization would like to have its services perceived by its customers, employees, shareholders and lenders". The author points to the cognitive sphere of perceptions of the service provider but he also suggests the potential divergence

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[1] As for service providers, for example, the set of preferences include the perceived quality by users and policy makers and cost control. As for users, the vector of preference include the quality of life after the ambulatory surgery adoption, influenced by the length of stay in hospitals and also the potential resistance to changes associated with new innovation processes. Since the respective sets of preferences can be more or less aligned with regard to the adoption of an innovation, issues of politics, power and persuasion can play a key role in determining the direction and form of an innovation. In addition, within the same service organization there may be a common shared preference set or, conversely, a different set of preferences for different groups and, in case of a strong divergence, the relative power of groups will impact on the success and the form of the innovation (p.664, in note).

between the respective perceptions (that are influenced by the pre-existing set of preferences). According to Edvardsson & Olssen (1996), the service concept is a detailed description of the customer needs and wishes to be satisfied and this requires the understanding and aligning them with the organization's intentions (Goldstein et al., 2002). Within the operations management tradition, Sasser et al., (1978) includes in the service concept the subjective importance attached to each component of the service package by the customer, and, actually, this mirrors the set of preferences and expectations that the customer has. Clark et al. (2000) use the expression "service in the mind" to indicate that the service concept has not an object reality but instead is a "picture" of the value, form, function, experience and outcomes of the service, as it is in the mind of managers, employees and customers. Pointing to the risk that customer have different assumptions from what is intended or delivered by the service provider, they consider the clear articulation of the service concept as an essential tool to align different assumptions, expectations and preferences. We assume, adopting the language used by Clark et al., 2000, that the service offering as designed by managers reflect the "intended" service concept (Roth & Menor, 2003) and should be planned taking into account what the customer is willing to pay ("value"), how the service will be created and will operate ("form and function") and the benefits, stated or assumed, that the service would provide to both customers and the organization ("outcome") (see fig.1).

In addition to altering the service characteristics or the competencies of agents, the adoption of an innovation brings about changes in some sets of preferences and hence it can trigger a process of mutual influence and interactions between the preferences of different agents (Windrum & Garçia-Goñi, 2008). In their work, authors maps the interactions between agents in terms of preferences and report how these drive the direction of the innovation. Users' behavior, for example, affect the preferences of the service providers with regard to the organization of work within the hospital (then, also their set of competencies), and, conversely, the service providers influence users' preferences, removing their initial resistance to change (i.e. the adoption of ambulatory surgery). To this stage, we point to the fact that, although not expressly said in the paper and expressed in the model, the mutual influence between the sets of preferences of the agents involved is not a direct relationship. Neither it is simply mediated by the impact of successful development

of ambulatory surgery (i.e. by performance outcomes) or changes in the service provider's vector of competencies. Indeed, any changes in each agent's set of preferences (as well in the vectors of competencies and final characteristics of the service) is mediated by the interaction patterns carried on during the actual production and delivery of services by both hospital's staff and users (i.e. patients). Indeed, it is just through repetitive interaction performances between workers and users (i.e. routines) that learning-by-doing and learning-by-interacting are possible for both groups of agents bringing about increased specialization (changes in competences), reduced waiting times (changes in performance outcome) and, finally, a re-evaluation of their preferences (i.e. the acceptance of the innovation).

In order to understand the relations existing between changes in the sets of preferences of the actors involved (i.e. a dimension of service innovation) and those occurring at the level of organizational routines, we anchored the concept of "preferences", as intended in the service innovation literature to that of interpretive schemes, assumptions and expectations as adopted in organization and management studies on practices and routines (Orlikowski, 2000; Feldman, 2003; Tucker & Edmondson, 2003; Schultze & Orlikowski, 2004; Howard-Grenwille, 2005; Levina & Orlikowski, 2009; Rerup & Feldman, 2011). Drawing on "structuration theory" (Giddens, 1979), Orlikowski (2000) considers interpretive schemes (next to facilities and norms) as a dimension or modality that mediates between the structural properties of social systems - such as technologies instantiated in practice (Orlikowski, 2000) or network relationships (Schultze & Orlikowski, 2004) - and social action, since, in their recurrent interaction patterns (i.e. routines), actors draw on a variety of assumptions and expectations, that, in turn, are based on the interpretive schema they adopt in evaluating reality. Interpretive schemes (e.g. assumptions and expectations) constitute together with the recurrent interaction patterns the domain of human agency, that is the ability for actors involved in carrying on routines to form and realize their goals (Emirbayer & Mische 1998; Giddens 1984). In her empirical study, Feldman (2003) shows how the interpretive schema of organizational members influence their performances within the routines and so affect change. Schema reflect the understandings that people have about how the organization operates and guide them in choosing whether to enact a required change. Such an understanding is influence by relevant performances, such as the

performances of the supervisor. This means that if a specific desired change (e.g. by managers) require performances that are inconsistent with the understandings about how the organization operates and with the performances that create and maintain these understanding, the change is unlikely to occur (Feldman, 2003:749). Translated in the context of service innovation, we deduce that the interpretive schema in question are those principally related to the internal service organization's staff and external users involved in the repetitive co-production of a service and that, accordingly, both the categories of actors, as interacting agents during the enactment of routines, influence their evolution. We can deduce that, if has been argued that management should take into account users' preferences in articulating the service concept, not sufficient attention has been hitherto devoted to assumptions and expectations of the staff directly involved in the production and delivery of service routines and how they understand how the organization works.

Adding to previous research on schema and routines, Rerup & Feldman (2011) show how not only that schemata can influence routines, but that also routines can influence schemata, i.e. they are "coconstituted" through the actions people take to solve problems in routines and questions about schemata. The author refer to organizational interpretive schema as the "values and assumptions that provide organizational members with a common base of action and thinking" and that "is expressed over time as both exposed and enacted". The exposed schema is what managers (and other members) claim their organizations is or should be about and is usually re-articulated/recreated by managers to address new problems and challenges (indeed, the service innovation process can be triggered by the deliberate strategic choice to provide an answer of new problems or challenges); conversely, the enacted schema is a specific pattern that depends on the actual actions people in and around the organization to realize the espoused schema (Feldman & Rerup, 2011:586). Within the context of service innovation, the exposed schema, as articulated by management, include their preferences and contribute to give content to the "intended" service concept, together with the interpretive scheme of external agents, mainly users and other business partners. In this respect, the distinction between business-to-business and business-to-consumer services can help to identify if individual or organizational interpretive schema play a key role in influencing the dynamics of service innovation, whereas the potential involvement of users in the

service innovation process can probably led to a higher alignment between their respective expectations and hopes with regard to the organizational reality (of the service provider) to enact. The empirical study can provide useful insights when translated in the context of service innovation. Indeed, it shows that on the one hand the exposed schema influenced the specific performances enacted in the examined routine. However, during repetitive social practice (i.e. interaction patterns) actors can determine through different learning mechanisms not only to change in the ostensive dimension of the routine, but also challenged the exposed schema (and its underlying assumptions) when they have to solve more general questions, so enacting a schema that substantially differs from the schema exposed by managers. This seems to suggest us that when the service provider's preferences are exposed through a new schema in order to realize an innovation, the mechanisms of trial-and-error learning (we can add the mechanism of learning-by-interacting) on the part of the staff involved in the production and delivery of services can lead to challenge initial assumptions and modify the goals that would orient their future actions.

2.4.2. Relationships between changes in competences and service delivery routines

In the service innovation literature, "competences" were originally proposed as a key vector of service innovation in the so-called "characteristic-based approach" (Gallouj & Weinstein, 1997) and kept in all further elaboration, extensions and modification (Djellal & Gallouj, 2005; 2008; de Vries, 2006; Windrum & Garçia-Goni; 2008; Gallouj & Tuominen, 2011). However, we found a little ambiguity and confusion with regard to the meaning attached to the construct in the relevant literature and this actually prevent us to immediately bridge competences and routines drawing on strategic and organizational traditions. Accordingly, we decided to firstly put more order and clarity about "competences" as intended in the service innovation stream[2]. In their original framework, Gallouj & Weinstein (1997:545) claim: "the vector of competences [C] mobilized in the provision of a service relates only to individual competences or to a clearly delimited group, namely the team involved in providing the service. It does not include organisational competences, which fall within the

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[2] In this stage, we shall limit our analysis to the vector of competences of the service provider because of space limits of the paper. However, we believe that the argument can be easily transferred and extended to the competences of other actors involved in the service innovation process, mainly customers and other business partners. We would set out to do it in a future version of the paper.

scope of intangible technical characteristics [X]". According to the authors, individual competences derive from various sources (e.g. initial education, training, experience, etc.), can be both tacit and codified and of different nature (e.g. cognitive, relational, creative and operational). Differently, organizational competences are always codified and formalized in nature and exist independently of individuals (this actually ensures the survival of the service company regardless specific individual competences available). They include formal rules and procedures, plans, evaluation methods, files, etc. making up the so-called "organizational memory". In the provision of services individuals not only exploit their competences but also mobilize organizational competences. Furthermore, accordingly to a dynamic perspective on innovation, individual competences are socialized and formalized, so shifting to the level of organizational competences and being available to all members of the organization. It is worth highlighting that, adopting Nelson & Winter's (1982) language, the authors consider individual competences as the equivalent of "skills" and intangible organizational competences as the equivalent of "routines" (or the more codified part) (Gallouj & Weinstein, 1997:545). We will turn to this point later when linking competences to service delivery routines.

Proposing a modified version of the original model, Windrum & Garçia-Goni (2008) draw on Barras's work (1986; 1990) to distinguish between user-facing competences and back-office competences. The first include all the tangible and intangible skills, know-how and technologies used to produce and deliver the service characteristics and mobilized by service providers when interacting with their users; the last are the skills and supporting activities that support user-facing competences and activities. In their model, competence characteristics are interpreted very broadly (Gallouj & Toivonen, 2011): they also include the technical and process characteristics and hence also what Gallouj & Weinstein (1997) had labelled "organizational competences". In the most recent version of the original model, Gallouj & Toivonen (2011) proposed to include the distinction between back-office and front-office for all vectors, but with a significant variation with regard to the vector of competences. Indeed, while "individual competences" are kept as the components of the "competence-characteristics vector", the authors considers the competences linked to

organizational learning and organizational memory as genuine competence characteristics, belonging to the 'back office'.

In the attempt to exploit strategic and organizational literature to bridge the variations in competences with variations in service delivery routines, we shall take into account how the concept of "competences" has been discussed in such a literature in order to understand: i) to what extent its meaning overlap with that attached to the term from service innovation literature; ii) how the concept of competences (in the more appropriate meaning) can be related to that of organizational routines.

Within strategic and organization traditions, there is a lot of fuzziness about the meaning attached to the term "competences". Indeed, source of ambiguity derive from the difficulty to clearly distinguish it from other related concepts, namely "skills", "capabilities" and "routines" (Coriat & Dosi, 2002; Dosi & Marengo, 2000; Dosi, Nelson & Winter, 2000). An additional source of confusion derives from the level of analysis (organizational, group or individual) to consider when talking about them (see Salvato & Rerup, 2011). In general terms, skills are considered as individual properties (Nelson & Winter; 1982; Cohen et al., 1996; Dosi et al., 2000). In this sense, it should be incorrect talk about "organizational skills" or, as suggested by Coriat & Dosi (2002:281), when using the expression "skills of the organization", it would simply refer to "the collectivity of skills possessed by individuals in the organization" (that is not equivalent to organizational competences). In Nelson & Winter (1982), "skills" are considered as equivalent to "habits", since they are developed and deployed through highly frequent, often automatic and unconscious repetitions of the same task or activity. In defining skill as a "goal-directed, well-organized behavior that is acquired through practice and performed with economy of effort", Proctor & Dutta (1995:18) underline some important elements (Winterton, Le Deist & Stringfellow, 2005): i) skill develops over time, with practice; ii) it is goal-directed in response to some demand in the external environment; iii) it is acquired when components of behaviour are structured into coherent patterns; iv) cognitive demands are reduced as skill develops. At the individual level, the term "competences" is also used, especially in behavioral psychology and organizational behavior, where it generally is described as a more complex concept than skills (see Winterton et al., 2005), including "knowledge, skills and abilities (KSAs) that are

critical in determining how results will be achieved" (Aguinis, 2009, in Salvato & Rerup, 2011:474).

To this stage, returning to the service innovation literature, we can clearly notice that, faithful to Weinstein & Gallouj (1997), it is conceptually appropriate to adopt the distinction between the individual and collective level, but since competencies is something more than skills, it would be better to talk about "skills and individual competences" to avoid any ambiguity as well as to attribute them the meanings respectively intended by Proctor & Dutta (1995) and Aguinis (2009). In organizational literature, scholars have noted the connection existing between individual skills and organizational routines (e.g. Nelson & Winter, 1982; Cohen & Bacdayan, 1994; Betsch, Haberstroh & Höhle, 2002; Feldman & Pentland, 2003). In the evolutionary theory, skills are considered as the analogue of routines at the individual level (Nelson & winter, 1982). They constitute organizational meta-habits (Hodgson, 2008) or "skill-like" organizational-level entities (Nelson & Winter, 1982). However, the link between individual skills and organizational routines has not been examined systematically (Salvato & Rerup, 2011). Indeed, the notion of skills is explicitly developed by Nelson and Winter only in a metaphorical manner and the routines literature goes directly to the social level, sidestepping issued about the underlying, individual-level dynamics such as motivation, predispositions, expectations and ability (Felin & Foss, 2009). In light of the identified gap, more studies at the intersection between the individual and collective level of analysis could offer a valuable contribution to expressly take into account individual characteristics and understand how organizational-level constructs (such as organizational routines) emerge as the result of individual interactions (Felin & Foss, 2009; Salvato & Rerup, 2011). With specific regard to services, it is clear that the chance to explore the connection between skills and service interaction patterns is also more challenging if we consider that skills and individual competences involved are not simply those of the service provider's staff, but it is also necessary take into account how their individual characteristics interact with those owned by external actors (and especially customers) that continuously change at each service encounter. It would be quite challenging explore how the postulated "truce" emerge when agents involved in the inter-organizational routines belong to different organizations, have different preferences, abilities and experiences.

2.4.3. Relationships between changes in technical (and process) characteristics and service delivery routines

In the "characteristics-based model" of service innovation (Gallouj & Weinstein, 1997) the vector of technical characteristics include both tangible and intangible components used to produce the service characteristics. Further elaborating the original model, Gallouj & Toivonen (2011) distinguish between technical and process characteristics (initially included in the first vector). Technical characteristics include in particular the service concept, blueprints and process flowcharts, technologies and artifacts, models and methods and the organization, whereas process characteristics are those elements of the service design and production that can take place both with or without the customer contact. In this respect, at least three observations are essential: first, the model conflate together elements of design with those inherent to actual production. Actually, the analysis of the empirical examples reported in Gallouj & Toivonen (2011) shows how the process is described according to what reported by interviewed people, but it not clear if the description corresponds to what intended by managers or if it is provided by actual staff involved in the production of the service. In any case, the description remain at a very general and broad level and no attempt to analyze the dynamics of service innovation change is provided. We believe that, in building a model of service innovation dynamics, it is necessary to keep on two separate levels the items of service design with those of actual service production and delivery, i.e. not conflating the "service process" with the "customer process" (Edvardsson & Olsssen, 1996); second, the service concept is viewed as a technical characteristic. However, coherently to our conceptualization of the service concept, we believe that it is useful to distinguish between the intended and the realized service concept (Roth & Menor, 2003) and, accordingly, to see the last as a component of the vector of service characteristics. (see fig. 1); third, the technical (and process) characteristic vector is too broadly defined, including a number of different items that, although related, could correspond, like in the case of technologies and organizational competences, to quite different ontological domains. In this respect, we believe that breaking down such a technical characteristics vector at least in its main components can help us to exploit the potential linkages existing between service innovation and organizational routines literatures. However, due to the limits of space, we will circumscribe our analysis only to some dimensions, and

specifically: the prototype of the process (e.g. blueprints, flowcharts) and its functioning (e.g. formal rules and standard operating procedures); ii) technology and its relation to organization; iii) organizational structure and network relationships.

As for the first dimension, it substantially corresponds to the intangible technical characteristics vector described in Weinstein & Gallouj (1997) and is a "process" component in the framework supplied by Edvardsson & Olssen (1996). It is worth highlighting that, in Weinstein & Gallouj (1997), organizational knowledge as codified in formal rules and procedures, blueprints and flowcharts is considered equivalent to Nelson & Winter's "routines". However, the analogy is only used in a metaphorical way and no further elaboration or close examination is provided, drawing on the relevant organizational literature. Within this, organizational routines are often identified with formal rules and standard operating procedures (e.g. Simon, 1945; Cyert & March, 1986; Egidi & Narduzzo, 1997; Adler et al., 1999; Malone et a., 1999). However, a number of scholars (e.g. Lazaric, 2000; Feldman & Pentland, 2003; Pentland & Feldman, 2005; Reynaud, 2005) have underlined that rules and routines are different entities, although a clear connection exist between them. Indeed, rules and standard operating procedures, usually used by managers to shape work practices, guide organizational behavior (Reynauls, 2005) and give rise to recurrent interaction patterns, i.e. the performative aspect of routine (Becker & Zirpoli, 2008), so constituting resources for action (Giddens, 1984). However, they do not directly determine performances because of the mediating role of human agency and because contexts vary (Feldman & Pentland, 2003). At the same time, it is also important to not conflate rules and procedures with the "ostensive" dimension of routines but rather ,and more appropriately, describe them as indicators or proxy of the ostensive aspect or as efforts to codify the ostensive aspect (Pentland & Feldman, 2005). In fact, organizational routines can be codified in the form of work rules and become institutionalized within the organization (Zucker, 1987); furthermore, rules and procedures, flowcharts and blueprints, as representation of routines, can actually reveal the cause of certain behaviors in organizations (Becker & Zirpoli, 2008). To this stage, we argue that classical service innovation frameworks should be further elaborated and extended in light of the above arguments with the aim of understanding the dynamics of service innovation rather than a simple description of its main change dimensions. Hitherto, for example,

blueprints, flowcharts and service mapping have been largely exploited as tools of service design (e.g. Shostack, 1993; Fließ & Kleinaltenkamp, 2004) and, more recent, of service innovation (e.g. Bitner et al., 2008; Bettencourt & Ulwick, 2008). Within a dynamic and processual view of service innovation, however, no effort has been done to specify how they contribute to generating recurrent patterns of behavior, that is, which are the causal mechanisms that can help to explain potential gaps between the "ostensive" aspect (of which these items can be viewed as proxies) and the "performative" aspect of the examined service-related routines.

As for technology, scholars have widely recognized it as a key dimension of innovation in services and new service development processes (den Hertog, 2000; Gallouj & Weinstein, 1997; Edvardsson & Olssen, 196; Bullinger et al., 2003). Actually, service technologies offer to the firms the opportunity to improve their competitive position through higher scale economies, flexibility, efficiency and specialization (Quinn, Doorley & Paquette, 1990) along with the access to external source of information and knowledge (Kandampully, 2002). Accordingly, technological innovation, intended as the development and implementation of new forms of technology (e.g. Van der Aa & Elfring, 2002) or, more often, the adoption of external technology solutions (e.g. Barras, 1986) is largely spread among services firms (CIS I, CIS II), and it also involves a significant number of not "high-tech" services (such as software and telecommunications). Although IT is not the only technology employed in services, not the only technological field in which service firms innovate, IT is pervasive across sectors and this stimulated a recognition that services were often users of innovation rather than innovators in their own right (Miles, 2000). Nevertheless, scholars in the demarcation and synthesis approaches have recognized that service innovation is possible without technological innovation, whereas technological innovation usually requires or lead to changes in other service dimensions, such as product, process, organization and co-production schemes (den Hertog, 2000; Van der Aa & Elfring, 2002; Gallouj & Weinstein, 1997; Gago & Rubalcaba, 2007). In particular, technological and organizational innovation should not be considered in isolation but as complementary forces that, in combination, may lead to firm's improved performances (Rubalcaba et al., 2010). Hitherto, however, service innovation studies have not seriously faced the issue of exploring in more-depth the nature of interdependences between technological innovation and other

forms of innovation, namely organization, trying to identify causal mechanisms. Indeed, if the success of implementing new IT tools is influenced by parallel processes of organizational change, that simultaneously can invest processes, products, organizational structures and co-production modes, technological innovation in service firms should not viewed simply as the purchase/development of a new material artifact to adopt in the organization. Conversely, it should be considered in its both "physical" and "social" nature (Nelson, 2009), that is putting attention to how technology is perceived, interpreted and enacted by people in the organization during their repetitive interaction patterns. In this respect, the research stream at the intersection between technology studies and organization theory and known as "technology and organizing" (e.g. Barley, 1986; Orlikowski, 2000; Pentland & Feldman, 2008; D'Adderio, 2008; Leonardi, 2011) can provide service innovation scholars with a variety of concepts, analytical lens and interpretive schemes that they can adopt to explore the complementary nature of technological and organizational innovation. In all these studies, a structurational perspective (Giddens, 1986), inherently dynamic and grounded in ongoing human action, is predominantly adopted to explain emergence and change in technology use. Technology is not viewed as external and independent of human agency, but as emerging from people's repeated and situated interaction with its material and symbolic properties. That is, it is only through repetitive interaction patterns of use that technological properties actually shape human action: users choose not simply to use/not to use a technology but rather how to interact with it, also using it in ways unanticipated by inventors, designers or managers (Orlikowski, 2000). As humans regularly interact with certain properties of a technology, they may also generate situated innovations, relying on experimentation and improvisation as a response to unexpected opportunities or challenges (e.g. Tyre & Orlikowski, 1994). Because of human agency, organizational routines, i.e. repetitive patterns of interdependent actions carried out by both human and not human agents (i.e. technological artifacts) are generative systems that challenge any deterministic assumptions about technology design and that can help to explain why a large number of technological innovation fail (Pentland & Feldman, 2008). Since agencies can attribute to technology very different functions and properties, they do not have object reality but rather display the so-called "interpretive flexibility" (Pinch & Bijker 1987). At the same time, technologies cannot simply reduced to their instrumental dimensions,

since action and cognition are distributed among both humans and not-human agents (hence technological artifacts). Accordingly, they play a key role in the performance and evolution of organizational routines (D'Adderio, 2008; Leonardi, 2011).

The above discussion can help us to shed light on some important aspects of service innovation. Indeed, the actual form and functions assumed by a new technological artifact (what is traditionally described as technological innovation) is influenced by service delivery routines. Indeed, repetitive interaction patterns determine which specific "technologies-in-practice" will be institutionalized in the service organization after the introduction of a given technological artifact. However, technologies are not infinitely malleable (Orlikowski, 2000; Boudreau & Robey, 2005) and "power of default" can be very strong (D'Adderio, 2008; 2010). This means that material features of technology along with rules, intentions and goals inscribed in it by service managers or designers actually limit the overall number of opportunities and modalities of technology use for people involved that, in the case of new technology-based interfaces, are both service provider's members and external actors, such as customers, business partner or providers of complementary assets.

Organizational routines literature and practice-based studies on technology and organizational change can also help to understand the interaction between changes in service delivery routines and two major forms of organizational innovation, namely organizational structures and network relationships, included those with customers (e.g. Gadrey & Gallouj, 1995; Ven der Aa & Elfring, 2003; De Vries, 2006). Changes in the centralization of planning and control functions or in the number of hierarchical levels are considered as typical examples of structural innovation with an intra-firm focus, whereas new forms of collaborations and partnerships with external actors are classified as structural innovation with an inter-firm focus (Armbruster et al., 2006). In this respect, scholars in the service innovation tradition tend to distinguish them from other organizational changes, since they result from strategic decisions made by management (Rubalcaba et al., 2010). However, micro-level studies with a focus on practice and interactions (e.g. Barley, 1986; 1990; Schultze & Orlikowski, 1996; Leonardi, 2007) have showed how changes in intra-firm or inter-firm structures (i.e. roles and relationships) can be also emergent phenomena, activated by deliberate technological innovations and institutionalized in

the organization through repetitive interaction patterns. In Barley (1990), for example, found that the adoption of a new CT scanner in hospitals gives technologists access to new valuable information, making them more central within their departments and hence altering formal relationships with radiologists. Similarly, the ethnographic study conducted by Leonardi (2007) shows how the information-sharing capabilities afforded by a new IT tool change the nature of social interactions within team's members that evolve from hierarchical, to democratic, to meritocratic. Indeed, technological innovation threw the social status hierarchy, making the network highly decentralized and making junior technicians more central than their senior colleagues. Finally, Schultze & Orlikowski' empirical work (2004), although never cited within service innovation studies, can provide valuable insights about the inter-organizational dynamics of service innovation and casts light on the mutual influence existing between changes in inter-organizational service delivery routines and changes in network relationships. In particular, the study revealed itself particularly interesting since it is conducted within the context of service organizations. As a consequence, main implications can be directly taken into account to build a more accurate depiction of service innovation processes. Through applying a practice lens, authors explore the implications of using self-technologies within inter-firm service relations aiming at understanding how such relations are created and recreated through micro-level interactions taken by firms members during daily work. Indeed, the study reveals that the use of IT altered the nature of information exchanged, the frequency of interactions and the level of social capital between sales representatives and customers. In turn, these changes in service delivery routines produce both intended and intended shifts in the network relations enacted by technological innovation and this seriously hazards the business model, traditionally viewed as a key dimension of service innovation (den Hertog et al., 2010). We argue that future research on service innovation should seriously take into account these in-depth micro-level studies on organizational change and routines in order to advance empirical research and theory development. The study in question, for example, has highlights that changes in network relationships can be a consequence of deliberate changes in other dimensions (in this case technology) but this does not means that this kind of change should not require attention by scholars because it is not deliberate in nature. Actually, it can lead to unintended and negative consequences for the service provider. The new business model associated to the

technological innovation cannot be simply considered as a "true" innovation, because this depends on the form and direction of actual interactions between sales representatives and end customers.

2.5.   Concluding remarks

Innovation research in service organizations is still in an emerging stage. Also when the focus is on a foundational issue, namely the nature of innovation in services, available theory leaves us with a number of unsolved issues. This essay has been conceived as we questioned about the source of replicability and change in service innovation processes and realized that existing concepts and frameworks have not yet clarified us about where we should look to assess novelty in the service organization and, more in general, within the overall service delivery system. Moreover, although existing literature has widely recognized the interactive nature of service innovation processes, a structuralistic perspective is still dominant in available empirical research. Unfortunately, this approach seems not very suitable to understand the underlying mechanisms that explains the innovation dynamics and the interaction among a number of service components and a variety of internal and external actors.

In order to fill this gap, we built the foundations for studying service innovation processes through applying a practice lens and adopted the concept of organizational routines to propose a new conceptualization of service innovation. We argue that looking at changes in organizational and inter-organizational routines that are involved in the production and delivery of services we are able to capture changes in all the relevant dimensions of the innovation process and to address the deliberate and emergent nature that simultaneously characterizes the co-evolutionary dynamics of changes in routines and other components of a complex service delivery system.

Our theoretical argument is grounded on the common ontology of services and routines, since they are both interactive and processual in nature. Indeed, it is just such a commonality that can help us to explain the similar trade-offs that, although in a contrariwise direction and in a different research traditions, have characterized services on the one hand and organizational routines on the other hand. In this respect, we specifically refer to the classical dilemma between standardization and personalization of services and the animated debate about organizational routines as

a source of stability, inertia and mindless behaviour or, conversely, as the locus of endogenous change and novelty in organizations.

Starting from a new conceptualization of service innovation, we analyzed in more depth the potential linkages that exist between changes in service delivery routines and those affecting the classical service innovation dimensions described in the relevant literature. More specifically, we chose to focus on a number of key dimensions, namely preferences, competences and technical characteristics, that are the building blocks of the original work of Gallouj and Weinstein (1997), to show how an organizational perspective can help us to cast light on the generative mechanisms that relate interactions between changes in organizational routines on the one hand and changes in vectors of service innovation on the other hand.

Clearly, this is only a first attempt towards the creation of a bridge between service innovation research and organizational studies that expressly adopt an interactive, structurational and practice based perspective in studying the dynamics of organizational change that is built in any service innovation process.

3. ESSAY 2 – EXPLORING INNOVATION THROUGH ORGANIZATIONAL ROUTINES: EMPIRICAL EVIDENCE FROM A LONGITUDINAL CASE STUDY IN THE SERVICE INDUSTRY.

Abstract

The paper aims at contributing to a process theory of service innovation framing it as "a form of organizational routines change". To this end we combine traditional frameworks from service innovation theory with literature on organizational routines and practice theory. Then, through a longitudinal, explorative and inductive case study, we trace the co-evolutionary changes that relate the traditional service delivery system dimensions with organizational (and inter-organizational) routines as they develop during the innovation process. The case study analysis shows the explicative and analytical potential of the new concept of service innovation that not only is consistent with its multi-dimensional nature, but is simultaneously able to capture variations in the service delivery system, the service process, and performance outcomes as well as to assess discontinuity and replicability. Furthermore, the analysis of micro-changes in the selected routines revealed that innovation stems from the complex interaction between deliberate and emergent changes enacted in daily routines and is highly influenced by human agency. Definitively, we believe that in understanding service innovation traditional descriptive models can largely benefit from the concept of organizational routine whereas the predominant structuralist perspective can be fruitfully integrated with an interactive model embracing practice-based concepts, such as structuration, enactment and human reflexivity.

3.1. Introduction

The organization of innovation processes in service firms has received a growing attention from a number of scholars in the service management and operations traditions (den Hertog, Van der Aa, & de Jong, 2010; Froehle & Roth; 2007; Sundbo, 1997). In this respect, there is a growing acknowledgment that innovation in services should be studied considering both its technological and non-technological components (Gago & Rubalcaba, 2007; Gallouj & Weinstein, 1997; Van der Aa & Elfring, 2002).

Yet, in these studies the conceptualization of organizational change needed for attaining service innovation still remains understudied and in many respects controversial. The term organizational innovation, here used as a synonymous of organizational change (see Lam, 2004), is traditionally referred to one of the five Schumpeterian forms of innovation (i.e. product, process, organization, input and market innovation) (Schumpeter, 1936) or to one of the multiple non-technological components of a complex service innovation system (DenHertog, 2000; Edvardsson & Olsen, 1996; Gago & Rubalcaba, 2007; Gallouj & Weinstein, 1997).

Indeed, new service offerings (including new organizational components) correspond to a discontinuous change in traditional ways of doing things (i.e. an organizational innovation or change) and a new reproducible delivery solution (i.e. a new service). The combination of these two elements results in improved economic performance only if service innovation actually reconciles two seemingly opposing goals, that are discontinuity and replicability (Drejer, 2004; Schumpeter, 1934). In order to achieve these goals in service innovation, firms have to manage complex interrelations existing between organizational innovation and other aspects and dimensions of service innovation (especially technology).

In this paper we analyse such interdependences through an in-depth longitudinal case study of a service firm that, in order to introduce new services, had to change its organizational processes accordingly, including its technological infrastructure and operations. The goal of the paper is to build a theory of service innovation that simultaneously addresses discontinuity and replicability.

In the paper we build on a recent turn in service innovation studies that documents the adoption of interactive, improvisational or contingency models of service innovation (Djellah & Gallouj, 2001; Edvardsson & Haglund, 1995; Moorman & Miner, 1998), as well as the existence of a practice-driven model (Toivonen &

Tuominen, 2009), where innovation is not formalized or strategically planned but, on the contrary, emerges as part of everyday operations and practices of the service workers (Crevani, Palm, & Schilling, 2011; Dolfsma, 2004; Toivonen & Tuominen, 2009). Organizational change processes are investigated as they occur in daily routines and operations. In this way, this stream of scholars aims at building a process theory of service innovation through understanding the underlying mechanisms that shape interaction between organizational change and the changes in other service dimensions[3].

In this study, however, we expand current literature in two fundamental ways. First, embracing an "interactive perspective" on innovation (Slappendel, 1996) and a "practice lens" focused on daily practices and routines (Orlikowski, 2000), we bridge service innovation studies with an approach that frames innovation in service organizations as a complex "structuration process" (Giddens, 1984) characterized by interactions between deliberate and emergent changes in inter-firm and cross-firm delivery routines and in other components of the whole service innovation system.

Second, we conceptualize service innovation as a form of "organizational routine change". According to this view, routines are actions, acts, performances and processes actually carried out in organizations and as such they own some key attributes of services. We claim that organizational routine provide a powerful lens to understand organizational change both as an innovation outcome and as a process and that the proposed definition of service innovation contributes to building a neo-Schumpeterian theory of service innovation (Drejer, 2004; Windrum & Garçia-Goñi, 2008) enabling to explore how service innovation emerges as a result of an interactive process through stabilized changes in delivery routines.

The paper is structured as follows. In next section we will expose our organizational-routine based conceptualization of service innovation and discuss some analytical and operational advantages inherent in adopting such analytical lens. We then introduce our methodology, describing the research setting and the data collection

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[3] Previous literature on organizing the innovation process in service firms addressed organizational change issues according to a structuralist perspective of innovation (Slappendel, 1996) along with a variance-based approach (Mohr, 1982). Indeed, in these studies the innovation process is mainly depicted as formalized, strategically designed, following a linear stage-based development model and only focuses on innovations in final service offerings (among others: Edvardsson & Olsen, 1996; Scheuing & Johnson, 1989). Accordingly, efforts have been mainly devoted to understand which organizational conditions (i.e. combination of structures, procedures, management systems, etc.) and dynamic capabilities can ensure better innovative performance during the different stages of the innovation process (den Hertog. et al., 2010; Froehle & Roth, 2007; Sundbo, 1996).

and analysis methods. The subsequent sections are respectively devoted to the case analysis, discussion and conclusion.

3.2. Theory

In our argument we frame service innovation as "a change in intra-firm and cross-firm delivery routines that have stabilized in a new configuration". Although more definitions of organizational routines are available in the literature (for a review see Becker, 2004), we explicitly consider them as "recurrent interaction patterns" for accomplishing tasks (Cohen et al., 1996; Feldman & Pentland, 2003; Pentland & Rueter, 1994). According to this view routines are actions, acts, performances and processes actually carried out in organizations and as such they own some key attributes that a well-established service marketing and management research tradition has attached to services (Gadrey, Gallouj, & Weinstein, 1995; Grönroos, 1990; Lovelock, 1983). As pointed out by Pentland, Yakura, & Singh (2011:2-3), "…for any service to be rendered, some pattern of action must have taken place. Thus, at the level of action, services share a common ontological foundation with processes and routines. Like processes or routines, services are composed of recognizable, repetitive patterns of interdependent actions".

Setting organizational (and inter-organizational) delivery routines as the unambiguous unit of analysis to assess service innovation is consistent with its multi-dimensional nature. In fact, although any change in one or more dimensions of a complex service innovation system could potentially represents a true innovation, this actually happens only when such a recombination of service components results in a new way of accomplishing tasks, i.e. a new set of delivery routines. This leads us to claim that the new definition of service innovation is able to incorporate the interdependencies existing between changes in different technological and not technological components, chiefly organizational change, of a complex innovation service system, with organizational routines actually working as a valuable unifying lens.

An organization routine-based conceptualization of service innovation is also faithful to a Schumpeterian perspective, since it simultaneously fulfils the apparently opposing requirements of replicability and discontinuity and along with keeping the economic meaning of innovation. As "repetitive interaction patterns" organizational routines constitute stable entities and stability ensures that service innovation does

not consist of specific, non-reproducible solution to a specific problem, but, conversely, results in a new stable and replicable delivery configuration (in terms of processes, systems and performance). At the same time, referring to routines for assessing the intensity of the realized change, we can precisely establish if it corresponds to a significant shift and interruption of an old routine system, resulting in a radical or incrementally new configuration, so distinguishing it from learning and competence development (Gallouj & Weinstein, 1997; Sundbo, 1997). Furthermore, in management studies the close link existing between routines and performance has been recently made explicit (Becker, 2005; Becker & Zirpoli, 2008; Pavlov & Bourne, 2011). This leads us to show how a routine-based perspective can be profitably used to establish if service innovation represents a new business opportunity through assessing its real economic impact.

Finally, studying service innovation through the lens of organizational routines leads the way for understanding how the service innovation process develops according to an interactive model in which planning and emergence are highly intertwined. The concept of organizational routines has been employed in the empirical research as a lens to understand organizational change processes as they occur in daily routines and operations (Becker, Lazaric, Nelson, & Winter, 2005), by exploring the complex interactions between deliberate managerial influence and endogenously induced change, mainly due to human actors involved in carrying out routines (Feldman, 2000; Feldman & Pentland, 2003). In this respect, notwithstanding the attempts of distinguishing organizational innovation from organizational change by depicting the first as the result of strategic managerial decisions, we believe that a separate investigation of deliberate and emergent aspects of change is not fruitful in a process theory of service innovation. This is especially true in light of the increasing importance attached in the academic community and among practitioners to a practice-driven model of innovation (Crevani et. al. 2011; Toivonen e Tuominen, 2009). Embracing an "interactive perspective" on innovation (Slappendel, 1996) and a "practice lens" focused on daily practices and routines (Orlikowski, 2000) innovation in service organizations is investigated as a complex "structuration process" (Giddens, 1984) characterized by interactions between deliberate and emergent changes in inter-firm and cross-firm delivery routines and in other components of the whole service innovation system. Framing service innovation

through the concept of organizational routine seems to provide a powerful analytical lens to understand the underlying mechanisms shaping such complex interaction.

3.3. Method

The study aims at building a process theory (Mohr, 1982) of neo-Shumpeterian service innovation that is grounded on an organizational routine-based perspective. Accordingly, we chose to conduct longitudinal case study research (Eisenhardt, 1989; Yin, 1994) in Drive Service (DS), an Italian middle-sized service firm holding a leading position in the fleet management sector in Italy, and we based our analysis on qualitative process data (Denzin & Lincoln, 1994; Miles & Huberman, 1994). The firm has been selected according to a theoretical sampling criterion (Eisenhardt & Graebner 2007). Boasting over twenty years of industry experience, Drive Service is today the largest Italian supplier of fleet management solutions. In 2004, the firm undertook a deliberate strategy of rapid growth, simultaneously pursued externally and organically. Starting from 2006, in partnership with a national company in the automotive industry, leader in the vehicle leasing market, Drive Service won competitive tenders for long-term contracts with some big customers in the Public Administration (P.A.) market, mainly the law enforcement agency and the security force. Such a decision sets the beginning of a complex growth-driven innovation process that simultaneously affects many technological and not-technological components of a complex service system as well as the intra-firm and cross-firm delivery routines of a core business process (see below for details). Consistently, the research context seems particularly suitable to explore our unit of analysis, i.e. the co-evolutionary changes in the above components and delivery routines, since these changes become transparently observable (Eisenhanrdt, 1989) through an analytical focus on daily practices and routines as they are carried out by people.

3.3.1. The analytical focus

Within the complex fleet management offerings, maintenance services historically constitute a core business component. These are arranged according to a modular product architecture that comprises a number of both planned preventive and corrective maintenance services to vehicles covered by contract (tear-off coupons, breakdown repair, oil fill ups, etc.), along with remote customer service and periodic statistical reports. Maintenance service offices are physically located in two different

sites in Italy whereas services are delivered throughout the country relying on a widespread network of machine shops, body repair shops and tyre-dealers. These actors had a formal agreement with Drive Service so as to provide maintenance assistance and repair services to all vehicles covered by contract. This does mean that they operate in the value chain with a dual role: on the one hand, they are firm's suppliers and receive payment for any maintenance performance; on the other hand, they are part of the service delivery system, as a front-office structure, since they directly interact with end users in need of maintenance assistance. Next to Maintenance Offices and the assistance network, front-office structures also included a Customer Service Unit (providing customer support through a call center), whereas back-office mainly comprises an Accountancy Department and a Contracting Office. Since we intend to observe how innovation emerges through changes in intra-firm and cross-firm routines, we carefully selected a process that was profoundly affected by the growth-driven market innovation process we reported above. After a preliminary round of interviews with top managers at DS, specifically designed to identify an appropriate object of investigation, we selected the so-called maintenance authority process. As the term suggests, authority is a complex process including a number of activities, mainly executed by staff in the Maintenance Office, aiming at release an authorization to official repair shops to effectively repair the vehicle.

3.3.2. Data Collection & Analysis

Data gathering covered the period 2007-2011. The main fieldwork phases lasted from November 2007 to March 2008 and from June to December 2010, with a focus on the last seven years of the firm, starting from 2005. Data was collected through 26 semi-structured interviews with current and former top and middle management, archival material and participant observation. In the second main research phase, one of the author spent two months in the Maintenance Office in Rome as a research observer, focusing attention on daily practices and operations as they were carried out by workers. In this stage, the focus was on the selected bundle of maintenance authority delivery routines and inherent changes. Observation was also integrated by a number of office-specific documents (i.e. copies of contracts, written estimations, statistical reports, e-mail communications, manuals) as well as archival material in the form of firm-specific documents (i.e. top management meeting presentations,

project reports, strategic development plans, minutes, organizational charts, BPR consultancy reports).

Through the use of multiple collecting methods we could triangulate data (Denzin & Lincon, 1994), whereas the prolonged engagement in the field helped us to catch the complexity and richness of the research context (Dyer & Wilkins, 1991) as well as to immerse ourselves in a deep retrospective understanding of the innovation process evolution and organizational routines changes. Altogether, both procedures enabled to secure the validity of results (Creswell & Miller, 2000).

Gathering, coding and analyzing data was carried on according to an iterative process. Drawing on literature on service innovation, organizational routines along with interactive and practice-based models of organizational change and innovation, we gradually identify core concepts moving forth and back between data and the relevant theory (Eisenhardt & Graeber, 2007). The transit from first order to more abstract concepts (van Maanen, 1979) was based on a juxtaposition with those available in the relevant literature (Suddaby, 2006) and it enables us to trace the recursive relationship between changes in the whole service delivery system dimensions and micro-changes in intra-firm and cross-firm delivery routines as well as linkages existing between these changes and performance outcome.

3.3.3. Framework development

With regard to the service delivery system, we chose initial labels from the so-called "integrative approach" to innovation in services (Gallouj & Savona, 2009) and specifically in the characteristic-based definition of products (Gallouj & Weinstein, 1997) along with subsequent extensions and operationalization (De Vries, 2008; Windrum & Garçia-Goñi, 2008). As for service process and operational delivery routines, we respectively drew on Djellah & Gallouj (2005) and the distinction between performative and ostensive aspects of organizational routines (Becker & Zirpoli, 2008; Feldman & Pentland, 2003). We first decomposed and then re-aggregated the initial categories, using both existing and emergent concepts. A brief description of the conceptual categories is given below:

- *Preferences: introduced in the characteristic-based framework by Windrum & Garçia-Goñi, (2008), they are used in this work as a label that simultaneously includes: i) the service provider's "exposed interpretive schema" (Rerup & Feldman, 2011) i.e. the top management's understanding*

about how the innovation process would be like to unfold. Such set of preferences is highly coupled with both vectors of competences and technical characteristics and shapes what we called strategic agency; ii) the service assistance network and end user's needs and expectations about the service delivery process and final service characteristics (i.e. quality, prices, contractual flexibility). They constitute key antecedents of daily interactions between these agents and the service provider's staff during the service delivery process, guiding what we called the operative agency. Overall, cognitive schemas, needs and preferences of the various agents in the service delivery systems define the content of the "intended service concept" (Roth & Menor, 2003).

- *Competences: faithful to the original conception in Gallouj & Weinstein (1997), we adopt this concept to indicate the individual skills of a delimited group (i.e., the Maintenance Office authority team involved in the provision of authority services). Additionally, as in previous works (De Vries, 2006; Windrum & Garçia-Goñi, 2008), such vector can also be referred to external actors' competences in the service delivery system (i.e. those of the maintenance service network).*

- *Technical characteristics: this broad category includes organizational structural dimensions, and specifically : i) various technological options (denHertog, 2000; Gallouj and Weinstein, 1997) along with other material artifacts (i.e. documents, manuals, equipments) used during the production and delivery of maintenance services; ii) plans, rules and procedures (Cyert & March, 1963; Simon, 1945) and, more generally, codified organizational knowledge (Gallouj & Weinstein, 1997) , traditionally viewed as proxy of the ostensive aspects of organizational routines (Becker & Zirpoli, 2008); iii) roles, responsibilities and management systems that reflect authority and power distribution in the organizational hierarchy (Barley, 1986; Orlikowski, 1996).*

- *Operations: we revisited Djellah and Gallouj 's work (2005) to anchor the concept of different group of operations and inherent distinct development paths, i.e. material (M), relational (R), informational (I) and knowledge (K) to the concept of "routines" (Nelson & Winter, 1982). To us, delivery routines inherent the same process (i.e. the authority process) can be*

decomposed in these four dimensions and it is true for both ostensive and performative aspects of routines (Feldman & Pentland, 2003; Pentland & Feldman, 2005).

- *Service characteristics: on the one hand this category includes tangible and intangible benefits expected both by end users (i.e. technical functionalities, service quality, customization) and the service provider (revenue increase, cost savings, competence development), contributing to create value for both agents and shaping the content of the so-called "enacted service concept" (Roth & Menor, 2003).*

Preferences, competences, technical characteristics and service characteristics contribute to define the ostensive aspects of routines as they give shape to the "realm of structure" by guiding, constraining and enabling actions, which emerge from the socio-material systemic interaction within the "realm of action" where operative agency affects effective behaviors enacting the "performative routines", often different from those shaped in the ostensive perspective (Barley, 1986; Rerup & Feldman, 2011). The result of this process is the observed service delivery, i.e. the actual performance outcomes, which may differ from the service characteristics, as they were perceived and planned in the original view.

The interaction between the two "realms" is bidirectional as when the ostensive aspects are "enacted" (Weick, 2001) in daily practices and routines, they are transformed by continuous feedbacks emerging from the socio-material interaction or from the observed service delivery. These feedbacks may be driven by processes of spontaneous coordination, learning by doing and cognitive savings which can have important consequences on the "realm of structure" by modifying preferences, competences, technical and service characteristics.

This theoretical approach to service innovation allows to highlight the distinction between deliberate and emergent change (Balogun & Johnson, 2005; Orlikowski, 1996). In the first case we refer to planned changes in structural elements, mostly as a result of strategic agency, while emergent changes are instead those resulting from learning and adaptation processes that realize during the enactment process of each innovation cycle, usually as an intended reaction to novel or unexpected situations and directly linked to the operative agency. The conceptual framework adopted in the empirical section to explore the service innovation process is showed in figure 2.

Figure 2: The service innovation process framework
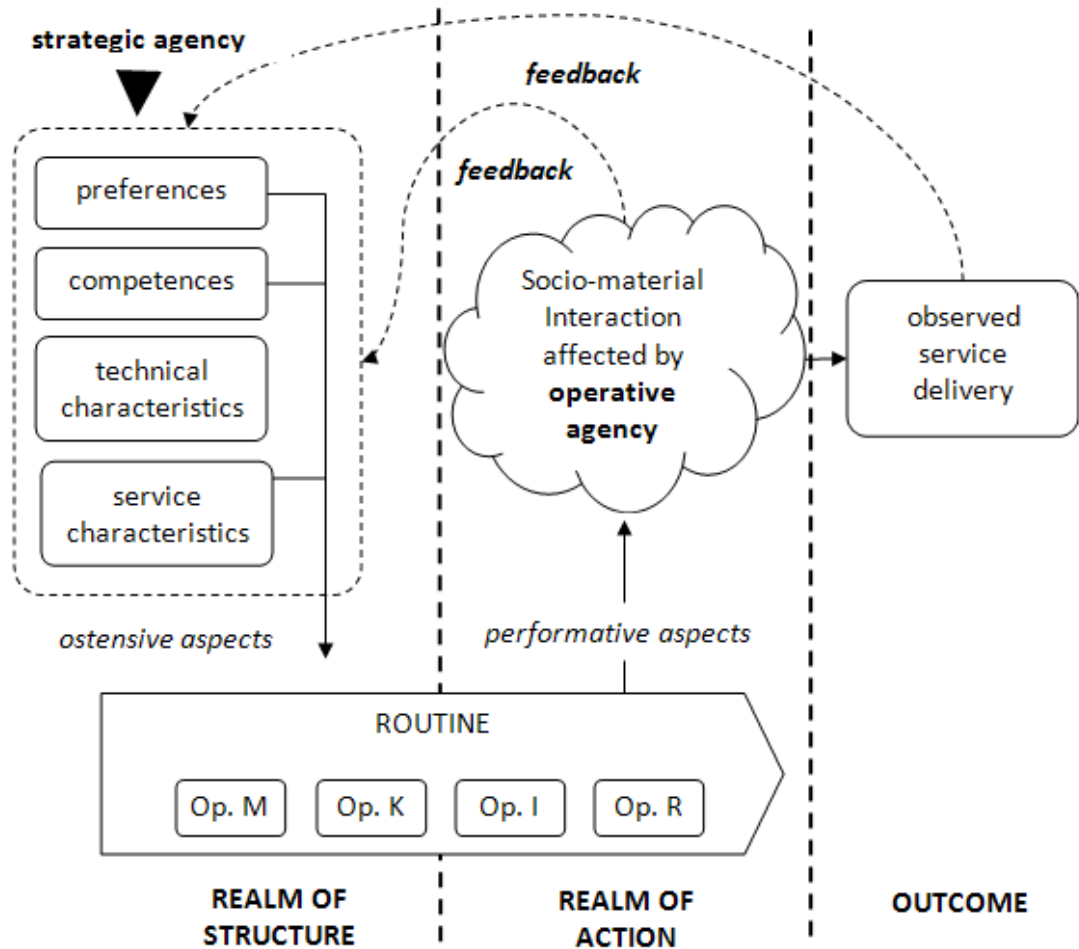
3.4. The case study

We present our results through a description of the innovation process triggered by the DS' strategic decision to enter new markets. The aim is to show how changes in traditional service dimensions influence the changes in delivery routines as well as these change mediate the interactions between the above dimensions. We first describe the ostensive aspects of the authority process as well as the network structure of the service delivery system before the market innovation. Subsequently, we report on the co-evolutionary changes in different components of the service delivery system as a result and medium of the enactment process of operational delivery routines.

3.4.1. The Pre-existing Scenario
The maintenance authority process: original routines

The maintenance authority process included a number of activities, mainly executed by staff in the Maintenance Office, aiming at releasing an authorization to official repair shops to effectively repair the vehicle. Indeed, whenever an end user brought his or her car to a repair shop, he had to put it an estimate for the firm, irrespective of the nature and number of maintenance performance required to re-establish correct working and safety conditions. The delivery operational routines inherent in the maintenance authority process included material, relational, informational and knowledge aspects. More specifically, all the activities enacted to transform the functioning state of vehicle so as to re-establish correct and safety conditions fell into this category. Additionally, we can also assign to this group all the interactions between human internal (i.e. maintenance staff) and external (i.e. mechanics) agents and material artifacts (mainly technological objects such as telephones, information systems, fax). Informational and knowledge domains covered all aspects related to information processing and knowledge exploitation during the execution of authority tasks. Finally, relational aspects were those inherent in inter-personal interactions between authority staff and repair shops, whose content was highly dependent on inter-firm governance modes (i.e. nature of contracts), norms of interaction and protocols about information exchange (Schultze & Orlikowski, 2004), all elements subsequently described as components of the technical characteristic vector.

Before entering the PA market, the ostensive aspects of the authority routines (including material, relational, informational and knowledge dimensions) were created and recreated through a stable pattern of "repeated and justified as appropriate" (Rerup & Feldman, 2011: 601) interactions. These latter were enacted: i) intra-firm, i.e. among and between maintenance office's workers as well as between these and back-office units' staff; ii) cross-firm, i.e. between and among maintenance office's workers, repair shops and end users. The process was triggered by the telephonic submission to the Maintenance Office of an authorization request made by a specific repair shop and directly assigned to a single technical operator. Once taken on a request, each worker carried out a bundle of "formal checks" on the information released by the repair shop, specifically regarding: the repair shop itself; the vehicle in need of maintenance; the number and typologies of performance to make on it; the relative prices of supplied services to the firm and delivered in situ to end users. This stage in the process served the purpose of mainly verifying that the applicant repair center and the vehicle at issue were respectively covered by a valid

(not expired) supply and delivery contract and that specific requested typologies were included in it. If there would have been any problems with such phase, an authorization could not be released and the process immediately ended. Otherwise, the same operator could proceed with subsequent "technical checks", at the core stage of the whole process, directed to establish the real functioning state of the vehicle and the coherence existing between this and the number and typologies of requested performance. At the end of this phase, the firm's worker set only a forfeit amount of money due to the supplier (i.e. the repair shop) for their maintenance services. Indeed, the authority procedure actually followed by each worker was called - in the firm language - "open authority", since the precise authorized amounts were only established after receiving a paper invoice from the supplier, containing all the information needed to verifying applied prices for spare parts and labor inherent in each repair performance. The subsequent phases of manual check and electronic registration of invoices were also assigned to the Maintenance Office, whose workers had to make all complementary formal checks and assessment, finalize the authorization at issue and finally transfer the bill data in a electronic system. At this stage, the process enter the accounting phase, carried on in the back-office (Accounting Unit).

The maintenance authority process: original service delivery system

Preferences. As for maintenance services, end users' needs and expectations depend on their daily habits of using vehicles. Indeed, as a component of fleet management packages, maintenance services were delivered to the workers of the firm's traditional customers, mainly large firms with self-owned or rented fleets. Accordingly, vehicle was only a peripheral good for end users' daily work and this resulted in a relative kept-down frequency of use and wear rate for vehicles as well as a lower need of corrective maintenance services. By attaching no particular importance to vehicles, users were not highly demanding in terms of expected overall performance, so being satisfied with ordinary working and safety conditions. To the firm, this set of preferences helped to guarantee an acceptable level of operational efficiency in the authority process along with a sustainable revenue model for maintenance services.

With regard to the maintenance assistance network, the set of expectations that mediated recurrent actions and interactions between the firm's staff and the repair

shops was basically of mutual interdependence, cooperation and reciprocity. Actually, agents in the assistance network were thought of trust and goodwill by the firm and recurrent interactions were basically shaped by strong linkages and a long-tenure with a narrow number of repair shops, who expected to interact indefinitely with the same agents (Maintenance Office's staff) and consequently tended to behave reliably, applying fair prices for their supply of maintenance services. In a nutshell, such interactions took the form of the so-called "service relationships" (Gutek, 1995; Schultze & Orlikowski, 2004) and formal contracts between parties actually existed, they were framed in a "promotion manner", focused on positive behavior in the exchange, inducing positive emotions, setting the stage for closer ongoing relationships (Weber & Mayer, 2011: 54). Ultimately, the assistance network performed a role of "representative broker" (Gould & Fernandez, 1989) for the service provider (DS), since repair shops' (i.e. brokers) interests tended to be aligned with the supplier for whom they acted as representatives (Schultze & Orlikowski, 2004).

Competences and Technical Characteristics. For maintenance authority activities, the firm relied on a team of specialists, endowed with technical skills and practical expertise, developed through working as apprentices with repair (body) shops and tyre-dealers. Such know-how was particularly critical to carry on the bundle of technical checks constituting the core stage of the whole authority process, since it was just during this phase that technical staff had to draw on their deep knowledge about a complex object (the vehicle) and relative functioning mechanisms to remotely establish the effective working conditions of the vehicle at issue and the pertinence of the relative estimate submitted by the repair shop. In accomplishing this task, personal skills had to be combined and integrated with the collective knowledge codified in a home-grown system database (named IDRA), where all the information about historical performance made on each contracted vehicle along with previous released/not released authorizations were inserted, stored, updated and could be accessed and consulted as needed. In this respect, the operator's capability to read and interpret in an integrate manner all the electronically available information to take decisions and assess the authorized amounts was seen as a key competence in carrying out the authority work.

Actually, IDRA represented, next to the phone, the main technological artifact during the entire authority process, serving the need to register all information transferred

verbally by phone and inherent in a specific authorization request (the assistance point, the contracted vehicle in need of maintenance, already driven kilometers, spare parts and labor prices, the specific maintenance performance to be done on the vehicle, etc.) as well as to automatically generate an authorization number through which the relative dossier could be subsequently identified, retrieved, re-worked and finally invoiced. Additionally, the system supported and simplified human work in the authority process with regard to formal and technical checks through some automatisms (i.e. detail fulfilment, computation) and an instant alert system, providing suggestions and additional details about a specific dossier/vehicle/contract. Workers could rely on stored knowledge about technical and legal details of contracts (both with suppliers and customers) also for accomplishing the stage of formal checks in the process. However, in assessing forfeit amounts of authorization they preferred to exploit their tacit knowledge at least for time and costs of labor and spare parts, so as to speed up the process and ensuring lower lead times for end customers. In this respect, the specific adoption of the phone as the main communication channel with repair shops led the way to a "learning by listening" practice in the Maintenance Office as well as the building of a tacit knowledge and shared competences among all the authority team's members, not only about formal stages but also regarding the more complex technical check and evaluation phases.

Administrative-accounting skills were also required to the Maintenance Office's workers. Indeed, before entering the PA market, they were also partially assigned to the invoice processing, having to verify their formal correctness, ending the authorization process and registering invoices electronically before transferring them to the Accounting Department. Although executed by the same technicians involved in the core authority activities, these tasks did not significantly affect service lead times since the repair shops could immediately proceed to repair the vehicle just after the release of a forfeit authorization. However, workers in the Maintenance Office reported complain about such kind of work, since it did not fit with their competences, causing loss of focus, specialization and productivity.

Finally, top management attached high importance to negotiation skills in executing authority tasks and managing relationships with suppliers. By leveraging these competences, authority team's members were able to easily bargain with agents in the assistance network, effectively mediating between repair shop's interest to maximize their profits along as well as fulfil end users' needs and requirements and

the firm's priority to hold down the overall authority costs. In this respect, the verbal exchange of information between authority staff and machine shop's owners led the way to develop dialectic abilities and build inter-personal relationships based on trust, goodwill and reciprocity, so setting the stage for a "representative brokerage" structural arrangement (Gould & Fernandez, 1989; Schultze & Orlikowki, 2004).

As for the organization of authority work internally to the firm, and more specifically within the Maintenance Office, all workers were assigned to the same tasks (i.e. processing telephonic authorization requests, registration in IDRA, formal and technical checking, assessment of authorized amounts, releasing an authorization number, subsequent processing of invoices). Calls were randomly allocated to them and usually the same operator started and ended the same call by communicating an authorization number. However, after invoices were received, their processing not necessary was carried on by the same worker who have previously managed the call request.

All members of the authority team worked under the supervision of a senior technician, who hold the informal role to control the regular stream of the work in the Office, beyond accomplishing himself authority tasks. Moreover, given his long-tenure in the firm and in particular within the Maintenance Unit, he was viewed by other younger technicians as the main reference figure for a number of technical and practical issues, i.e. understanding the functioning of IDRA or managing novel, unexpected and more difficult situations and problems.

Roles and responsibilities were not fully formalized in charts and documents and, more generally, the level of formalization was very low, both with regard to the description of operative tasks and activities (no standard operative procedures actually existed) and for performance management systems. In this respect, all information data used by middle management to elaborate reports and carry on performance analysis both for the authority process and employees in the Maintenance Office were only those extracted from the home-grown IDRA system, since a call tracking system was not available. However, data mining was not at all a simple process, since its database architecture was very old and hard-working to manage and it did not enable to track all steps during the process execution. As a result, available final performance data were quite approximate, so not providing accurate values for individual and process performance measures.

Service Characteristics. As for benefits expected by end users and directly dependent on the firm's conduct, answer rate and time-to-authorization for repair shops represented the key service performance indicators. Indeed, the two measures were interdependent since the more prolonged was the time required to process a specific call authorization request, the higher the likelihood to have a call unanswered. Before the market innovation, answer rate was hold up thanks to a call length ranging from 2 to 10 minutes, that in turn could be contained by relying on the mentioned "open authorization" practice. The subsequent invoice processing stage lasted 15 minutes on average, although it did not negatively affect delivery times for end users. Furthermore, by processing requests by phone, no backlog data entry existed so that receiving many requests in a day did not create particular problems and time pressure conditions in workers' daily routine.

With regard to the productivity and authority cost measures, statistics about individual productivity and process efficiency were elaborated in excel sheets by relying on the available data in the IDRA system. Specifically, the number of released authorization was used as the on proxy to measure the volume of activity, whereas associated authorization amounts (i.e. actually invoiced) were the main indicator to calculate overall authority costs. In this respect, in the year 2007 the number of authorizations released was 4000 a month on average, whereas the average cost of each authorization amounted to about 200 Euros in the same reference period. Finally, it is worth highlighting that the overall accuracy in assessing the total authorized amounts was, in general, very high; in fact, although authorized quotes were estimated only forfeit, the human error rate, calculated as the difference between forfeit and final authorized amounts, never exceeded 10%.

3.4.2. Enacting The Market Innovation Process

The innovation cycle triggered by the entry in new markets can be described according to four main stages. Initially, the cognitive schema exposed by the top management about the firm's growth options went up to interact with the preferences of the new agents in the service delivery system. Together, they went to significantly shape interaction patterns during the service delivery process, causing cross-firm delivery routines change (stage 2). However, change was initially enacted only in some aspects (i.e. material and relational) of routines, so triggering internal tensions in complementary aspects (i.e. informational and knowledge) of inter-firm and intra-

firm routines. In the subsequent stage, deliberate shifts in technical characteristics were introduced by top management to solve the above tensions. Finally, the enactment of new routines developed according to deliberate decisions but also emerges as a result of internal conflict resolution in component aspects of performative routines.

Stage 1. The exposed schema interacts with new preferences

In pursuing rapid growth, a higher market share and economies of scale, top management perceived the strategic option of exploring new markets more attractive than exploiting traditional ones. Such a preference was largely based on the belief that the firm would be able to replicate the same delivery system also for different typologies of customers (the Public Administration) and end users (public administration's employees, mainly the law enforcement agency and the security force). This through leveraging well-established technical competences, practice know-how as well as negotiation skills, developed during twenty years of experience in the traditional segments of the fleet management market (mainly corporate firms and long-term rental companies). To new customers, the firm would offer not only competitive price but also maintenance services in the form of flexible, modular and highly customizable packages, whose arrangement could be realized according to many options in terms of specific services and contractual details.

Having signed long-term contracts with new customers in the PA segment, DS had to enlarge its maintenance assistance network. Indeed, differently from traditional end users, the new ones did not operate in delimited areas; on the contrary, they were distributed across all the country, working in many cities and suburbs. Accordingly, the firm had to guarantee that contracted service points would cover all mobility areas of new users. However, top management did not attach high importance to extending agreements and, as a result, the exposed schema was enacted through outsourcing such activity. Unexpectedly, new repair shops were not selected according to any objective performance criteria but mainly on the basis of end users preferences and expressed choice.

The entry in the PA market led to a more complex structure of the service delivery system, as a consequence of the preferences of both new users and new suppliers/distributors (i.e. repair shops) who became carriers of new operative agency. Actually, for employees in the law enforcement agency and security force

the vehicle constituted an essential good for their daily activities, since a high mobility was constantly required by that kind of work. This did mean that both ordinary and corrective maintenance services would be, in absolute terms, highly frequent for this category of users and, consequently, relatively much higher than for traditional ones. The wear that derived from using cars in extreme conditions, such as for chase, was a case in point.

New preferences went also into play with the enlargement of the maintenance assistance network. Indeed, the new contracted repair shops were chosen by the same end users on the basis of pre-existing service relationships, developed through repeated interactions with the same provider and consequently oriented towards reciprocal gain. To some extent, the nature of these relationships was also influenced by the official role hold by new users. Indeed, as employees in law and security agencies, they were seen as powerful agents arousing feelings of respect, submissiveness and fear among repair shops' owners. Reflecting the mutual interests and preferences of repair shops and users, such pre-existing network arrangement would interfere with the nature of future interactions between the service provider (DS) and the distribution network.

Stage 2. Shift and internal tensions in inter-firm delivery routines

A number of primary changes in the work practices and interactions between authority team's members and new shop repairs occurred as mediated by the strategic agency as well as the new operative agency led by new actors. However, our analysis showed that such changes did not simultaneously covered all the component aspects of daily performance, but originally affected material and relational dimensions, then leading to internal tensions and problems with other performative aspects (i.e. informational and knowledge-related).

The massive reliance on the car by new users led to a significant increase in service maintenance needs that was only partially predictable by the firm. Indeed, although it was expected that a higher frequency of use would inevitably correspond to more repair performance as a result of excessive structural and mechanical strain, it was difficult to anticipate a few systematic and onerous breakdowns in some vehicles as well as the abnormal zeal that the new users showed in keeping the car at the top of its performance. In the Maintenance Office, the unexpected rise in the individual overall workload was not seen as a consequence of the planned market innovation;

instead it was mainly due to the over-average number of authorization requests submitted for new users' maintenance needs by new contracted distributors.

Material performative routines were also mediated by the set of assumptions and expectations implied in the nature of service relationships between new repair shops and end users as well as by norms of behavior and protocols of knowledge exchange between new repair shops and the firm. Indeed, repair shops interests tended not to be aligned with those of the service provider (i.e. submitting maintenance authorization requests only when actually needed along with applying appropriate prices for each repair performance). Conversely, the dominant attitudes were opportunism, self-interest and speculation, since sometimes they tended to submit authorization requests also when the functioning state of the vehicle was actually satisfactory and the delivery of maintenance services superfluous. In such situations, even though the worker in the Maintenance Office was suspicious of dishonest behavior, picking up real cases when this happened was really difficult without the physical closeness to the vehicle and the inherent chance to verify its actual conditions. Differently from what happened in the old network arrangement, inter-personal work interactions during authority tasks did not occur with an identified service provider, between a narrow number of repair shops' owners and well-known authority staff's members, but they were viewed by both exchange parties as anonymous service encounters (Gutek, 1995; Schultze & Orlikowki, 2004), regulated by written contracts. In these, although safeguards were framed according to a "prevention scheme" (Weber & Mayer, 2011:54), underlying vigilance and control by the firm as well as punishment for dishonest behavior of the repair shops, these tended to ignore such a frame by playing on end users' previous service relationships and their old complicity. In this regard, law and security agents often performed a connivance behavior with repair shops to the detriment of the firm.

Significant changes in relational aspects of performative cross-firm routines also occurred as a result of new contract clauses with end users. The high level of personalization and modulization of maintenance services led to flexible package solutions resulting in a large number of technical and legal details and options for the contracts. The number of specific typologies of maintenance performance included in the formula, the minimum number of kilometres to be driven enabling an authorization request, the change to apply penalties for car stops beyond an agreed time were highly variable not only for fleets belonging to different group of

customers, but also for different groups of vehicles related to the same customer. This variety led to an increase in the average complexity in the content of the authorization estimates submitted by repair shops as well as to a noticeable increase in the average amounts of each submitted request.

The new operative conditions and performative aspects of inter-firm delivery routines triggered some internal tensions with other constituting dimensions that did not visibly change as a result of the new service delivery structure. We refer to informational and knowledge-related issues inherent in the authority process itself. In light of the adverse behavioral attitude of repair shops, authority team had to cope with an abnormal occurrence of maintenance authority requests by augmenting the stage of technical checks, so as to more accurately verify in advance the physical and functioning state of the vehicle and then establish forfeit authorized amounts by phone. Indeed, longer times involved in this kind of knowledge-based activity did not well fit with the use of phone as the exclusive channel for transferring and exchanging information with repair shops. Actually, calls needed to be the shorter as possible not only to ensure rapid delivery times to end users, but also to avoid repair shops' displeasure with be kept on phone for a too long time, while the authority team's member was carrying out all checks.

Further difficulties arose when the authority process entered in the subsequent stages, i.e. when actual amounts to authorize had to be adjusted on the basis of more accurate formal checks and data entry in the IDRA system had to be made. To the authority team, it became harder and more time-consuming to carrying out formal authority checks, since they could not simply rely on their practical experience and tacit knowledge to evaluate times or prices of labor and spare parts as well as applied discount rates, since these was largely variable according to the specific supplier's contractual conditions. In this phase, it was not rare to find that significant differences between previously forfeit and definitive amounts constrained workers to re-work authorizations to a large extent, modify many values electronically inserted as well as inform the supplier about brought rectification. Furthermore, the longer times spent for accomplishing formal check authority work, together with traditional administrative-accounting duties, induced workers in the Maintenance Office to witness a significant worsening in the level of attention focus on technical issues.

The changes occurred in delivery routines revealed the limitations and inappropriateness of traditional competences and technical characteristics, that

actually did not fit with the new enacted service concept. Good technical and negotiation skills were not longer sufficient for accomplishing authority tasks, and, indeed, the new service concept required as well as create a new context where developing new knowledge and capabilities and in particular: customer relationship management capabilities, to effectively cope with specific characteristics and needs of old and new markets as well as to handle customers (this was true for the PA) with little or no experience on fleet management outsourcing and frequent speculative attitude; focus, monitoring and management of contracts costs and margins, to hold down overall authority costs and face toward opportunistic supplier's behavior; procedure and documentation knowledge and general contract overview, with the aim to easily manage complexity of customer operational procedures and contract prescriptions, recognize and appropriately manage authorization requests for special vehicles, ensure the fulfilment of very strict service requirements for fleets.

With regard to technical characteristics, the home-grown system (IDRA) traditionally used to carry on authority tasks revealed itself technologically obsolete. Although the Contracting Office provided for electronically updating relative databases, by inserting all needed information about new customer and supplier contracts, the relational architecture of the system was not suitable to easily manage the increasing complexity and variety of contract clauses. As a result, also by deciding to rely most heavily on codified information to accomplish formal and technical checks, the retrieval of electronic information during the processing of authority requests was not immediate nor successful for the employees in the Maintenance Office. In order to workaround the technical drawbacks of the system, simplifying electronic information retrieval as well as improving service delivery time, authority technicians started to create an electronic archive whose data were shared by all workers in the Maintenance Office. This database contained all contract clauses, procedures and documentation inherent in the contracts with all customers and suppliers but its consultation was much easier than the equivalent made in IDRA. That above described is an unexpected (so emergent) change resulting from the adaptation process of the authority team and enacted as a reaction to problems with existing technological constraints.

Stage 3. New shift in the service delivery system

Strategic agency embodied by top management mainly interacted with operative agency carried out by historical repair shops to shape the evolution of some deliberate changes in the service delivery system and in particular in the vector of technical characteristics of both the service provider (DS) and its suppliers (the shop repairs).

In order to improve operational efficiency and the overall service level, both at risk of disruption with the realized shift in work practices and routines, top management introduced, starting from the year 2008, some technological and organizational changes in the front-office structures of the service delivery system (Call Center and Maintenance Office). Such deliberate innovations mainly would serve the function to modify rules and procedures that had until then guided information exchange with customers and suppliers as well as knowledge exploitation practices within the firm.

Although not directly, technological changes in the Call Center Unit influenced the authority work to some extent. Indeed, the introduction of a Customer Relationship Management System would not only enable to directly measure performance in the Call Center; actually, by relying on its integrated functions of scripting and ticketing, it would serve the function of automatically and randomly dispatching authority-related calls to workers in the Maintenance Office and track them, in order to register waiting-times and overall lengths as well as to precisely identify operators who processed them. Accordingly, the overall service level was expected to significantly improve.

As for the authority work in the Maintenance Office, the fax technology was viewed by top management as the primary innovation. In this respect, they assumed that by relying on this technological artifact both for submission and reception of written authorization requests operational efficiency would have noticeable increased. More specifically, instead of verbally transferring needed information by phone, more complex and onerous authority requests could more effectively be managed by the authority team through carrying on all formal and technical checks offline. Both parties (i.e. the repair shop and the worker) would significantly benefit from this innovation: on the one hand, the repair shop would avoid waiting on the phone during the request processing (since this time was increased on average with new customers); on the other hand the authority operator would focus, monitor and verify

contracts costs and margins with increased accuracy so as to keep down overall authority costs and handle potential opportunistic supplier's behavior.

The adoption of the fax as an alternative channel to submit authorization requests implied a novel internal organization of work both within the Maintenance Office and between internal units (i.e. the Maintenance office and the Accounting Department). Internally the Maintenance Office, the senior technician was assigned the formal role to randomly and manually distribute all written requests centrally received by fax to all authority operators, by ensuring an equal distribution of overall daily workload. Each worker had still to entry all information related to a specific authorization request in the IDRA system as well as rely on it for an automatically generated authorization number. However, he had to carry on all formal and technical checks upstream of accurately assessing the overall authorized amounts and subsequently releasing the authorization. In this respect, each operator was endowed with a personal fax for re-sending the processed estimate with an authorization number as well as any corrections and adjustments made in the submitted quotes. At the same time, in order to promote more technical focus, employees in the Maintenance Office were totally relieved of accomplishing invoice processing tasks that, in turn, were partially allocated to another office before moving to the accounting Department. Accordingly, some constraints were introduced in the IDRA system to foster the new authority procedure ("closed authorization") but at the same time some new automatisms and instant suggestions were integrated in the system in order to facilitate authority work and problem-solving stages.

Finally, the successful introduction of the fax as an authority tool would highly depend on the attitude of suppliers towards the new technology. Indeed, the novel technology would lead to new protocols of information exchange and rules of behavior for shop repairs, beyond the purchase and adoption of the same technological innovation (the fax) used by the authority team. For more onerous and complex repair performance, both old and new suppliers would be constrained to precisely fill a written estimate with a number of information that they were used to transfer verbally and send it to the Maintenance Office by fax along with subsequently using the same artifact to receive an answer. Moreover, in order to appropriately channel authorization submissions, an economic criterion was introduced for shop repairs. More specifically, since on average the complexity of the maintenance service package grow steadily with inherent authority costs, an

economic threshold value was established to separate requests to submit by phone or by fax. Accordingly, each worker in the Maintenance Office was simultaneously charged to process authorization requests submitted by phone and by fax.

Stage 4. Solving internal tensions through shifting routines
The implementation of the described structural changes developed according to an innovation model of "rapid application" (Toivonen & Tuominen, 2009): through an experimental stage, the adoption of the fax was initially tested with a limited number of trusted repair shops, primarily because they were considered more open –minded than the new network's members and then more culturally oriented towards technological innovation. The experimental phase lasted all the year 2008 and revealed itself as successful. As a result, top management decided to extend the use of fax to all repair shops.

A number of changes in inter-firm and intra-firm performance aspects of routines occurred as expected by top management and so perfectly aligned with their ostensive view. Greater and immediate changes were visible in informational and knowledge-related aspects of delivery performance since deliberate changes in organizational structures mainly aimed at solving tensions and problems aroused in such dimensions. More specifically, by relying on a written estimate for more complex maintenance services, the authority staff's members could actually work in conditions of reduced time-pressure, doing formal and technical checks as well as relying on their know-how and practical expertise to establish definitive authorized amounts with lower human error rate. Moreover, they could attach more time and focus attention on technical matters, by saving time in unsought accounting tasks. Next to positive organizational outcomes (especially in terms of increased work specialization and new capability development), the innovation process led to pursue the planned goals in terms of productivity and operational efficiency. In this respect, although the monthly production volumes and the average cost of an authorization respectively increased of 17% and 9%, new operative conditions set the stage for an overall productivity increase of about 10%.

However, a number of unexpected changes also emerge during work practice and daily interactions as a result of the adoption of new technology, along with more complex operative rules and procedures as well as information and knowledge management protocols. First of all, using fax contributed to creating some

bottlenecks in the regular flow of the authority process. A low cultural and educational level of most shop repairs, jointed with a low familiarity with technological artifacts and word processor tools, could lead to submit incomplete, crabbed or sketchy written estimate. Workers in the authority team adjusted to such events and solved the trouble by shifting to the phone channel and directly calling shop repairs. However, such a practice contributed to lengthen overall service delivery time, also because requests submitted by fax were not immediately assigned and processed as it happened for those made by phone. Difficulties also arose from the simultaneous allocation of each worker to both verbal (i.e. by phone) and written (i.e. by fax) tasks. Indeed, the overall increased complexity in accomplishing the authority task (because of new formal checks along with more difficult technical evaluations and problem-solving tasks) made it difficult for an operator to interrupt her ongoing offline work to assign and process a call. The rise of lead times between the submission and allocation of written authorization requests sets the stage for an increasing number of reminders both from shop repairs and end users in the form of calls and e-mail to the Call Center and the Maintenance Office, and in extreme cases even the repeated submission of the same estimate by fax. When reminders caused repeated pressure or concerned special vehicles (whose a longer car stop caused penalty payments), retrieval of specific solicited requests was particularly hard among a pile of many estimates and additional documents. All such work conditions led to re-working, lower power of concentration and increased psychological tension, beyond physical bulk and higher paper costs.

Material and relational aspects of performative routines were clearly affected by such changes in informational and knowledge-related dimensions. More specifically, all tensions and problems deriving from backlog workload triggered a vicious circle, leading to longer repair times for vehicles and dissatisfaction with end users and customers, in turn, causing more reminders and solicited requests. Moreover, for workers in the Maintenance Office the reduced verbal interaction with repair shops made it more difficult to manage relationships and exacerbate tensions and attitude towards cooperation and trust-building. Within the Maintenance Office, the massive reduction of verbal authority tasks resulted in lower chances of learning by listening whereas the increased time pressure left little space to knowledge sharing and mutual help; on the contrary workers tended to carry on authority tasks autonomously,

facing problems through contingent solutions rather than identifying precise causes so acting directly on them.

3.5. Discussion and conclusion

The idea that organizational change has a crucial role in service innovation has been widely accepted (Djellah & Gallouj, 2001; Van der Aa & Elfring, 2002; den Hertog. et al., 2010; Sundbo, 1996). Our study aims at building a process theory (Mohr, 1982) of neo-Shumpeterian service innovation that is grounded on an organizational routine-based perspective. Indeed, through adopting a novel conceptualization of service innovation, the case study explored how it emerges through an interactive process in the form of new intra-firm and cross-firm delivery routines. In this way, organizational change can be understood simultaneously as an innovative result and its underlying process.

Our point of departure was the traditional conceptualization of service innovation. Indeed, in the relevant literature it is largely recognized that service innovation can assume one or more forms, i.e. all those described by Schumpeter (1932). At the same time, it is described as a change in one or more technological and non-technological components of a complex service innovation system (DenHertog, 2000; Edvardsson & Olsen, 1996; Gago & Rubalcaba, 2007; Gallouj & Weinstein, 1997). Furthermore, in all theoretical and empirical work grounded in the so-called "characteristic-based approach" (Weinstein & Gallouj, 1997), efforts have been devoted to discuss how the final service characteristics depend on the reciprocal interactions between and among vectors of preferences, competences and technical characteristics of agents in the service delivery system (De Vries, 2006; Djellah & Gallouj, 2005; Windrum & Garçia-Goñi, 2008).

By tracking the qualitative changes in both specific service delivery routines (i.e. those related to the authority process) and the whole maintenance service delivery system, our findings are consistent with such a literature. Indeed, in our case study since service innovation occurred in a number of interacting forms (i.e. market, process, product service, process and organizational innovation) and revealed itself as a complex multi-dimensional phenomenon, involving a change in the service concept (den Hertog, 2000), in the technological dimension (den Hertog, 2000; Gago & Rubalcaba, 2007; Weinstein & Gallouj, 1997), in the competencies of the service provider (den Hertog, 2000; den Hertog et al., 2010; Weinstein & Gallouj, 1997), in

the set of interests and preferences of different agents in the whole service delivery system (Windrum & Garçia-Goñi, 2008).

However, although confirming the descriptive value of existing frameworks on service innovation, our findings showed the analytical advantages of framing service innovation as a form of "organizational routines change" as well as the explanatory power of a "practice lens" in exploring how changes in the above traditional dimensions influenced changes in service delivery routines (both within and cross-firm) and how, in turn, such changes, through stabilizing in a new configuration, affected the resulting new service delivery structure and performance outcomes. Indeed, such a definition is consistent with the multi-dimensional nature of service innovation, since it simultaneously addresses changes in the service delivery system (i.e. preferences, competencies and technical characteristics), the service process (i.e. the service delivery routine), and performance outcomes (i.e. the final service characteristics). We reported that, in an initial stage, the set of interests and preferences of the top management (i.e. the strategic option of exploring new markets leveraging well-established technical and negotiation competences, practices and know-how) was enacted through competing for long-term contracts with new customers in the P.A. market and by outsourcing the extending agreements activity. These actions put in play well-defined and pre-existing set of preferences for both new users and suppliers/distributors that, together, went to shape interaction patterns during the service delivery process, causing cross-firm delivery routines change. In turn, some unexpected problems in accomplishing new performances triggered a learning–by-doing process and the development of new competencies for the authority team but also emergent changes. Subsequently, the new resulting operative conditions induced top management to introduce some changes in the technical characteristics of the service delivery system (i.e. the introduction of fax, a new work organization and new operative procedures) in order to adjust the management of informational and knowledge flows as well as to enable the further development of the new mentioned capabilities. Then, through the enactment of new performance routines, adaptation and further learning-by-doing and learning-by-interacting (especially with external actors) influenced the resulting structure of the process (i.e. the ostensive aspect of delivery routines) as well that of other second-order structures, i.e. the resulting vectors of technical characteristics and competencies.

Overall, although the final service characteristics (i.e. overall productivity and delivery lead time) were influenced by the changes in the vectors of competencies and technical characteristics, their actual values were directly caused by the organizational routine performances enacted during the service delivery process. This did mean that such a process mediated the influence of second-order organizational structures on final performances. Specifically, the case revealed that the combination of changes in service delivery routines and the service delivery system led to some positive organizational outcomes, i.e. increased work specialization and new capability development and at the same time enabled to pursue the planned goals in terms of productivity and operational efficiency. However, our findings also shed light on some unexpected changes that emerged during daily routines and that negatively affected service delivery time and user satisfaction.

Relying on an organizational routine based conceptualization of service innovation, our work aims at building a theory of service innovation that reconciles, faithful to a Schumpeterian tradition, two seemingly opposing goals, i.e. discontinuity and replicability (Drejer, 2004; Schumpeter, 1934) since they are both essential for the economic value of any innovation (Drejer, 2004; Gallouj & Weinstein, 1997; de Vries, 2006; Windrum & Garçia-Goñi, 2008). Indeed, in order to achieve these goals, service firms have to manage complex interrelations existing between organizational innovation and other aspects and dimensions of service innovation.

Literature on service innovation has discussed replicability and discontinuity especially with regard to two forms of innovation, the so-called ad hoc innovation and formalization innovation (Gadrey, Gallouj, & Weinstein, 1995; Gallouj & Weinstein, 1997). Defined as an "interactive (social) construction to a particular problem posed by a given client" (Gallouj & Weinstein, 1997:549) it is only indirectly reproducible through codification and formalization of experience and competences developed in constructing the particular solution. According to Drejer (2004:557), such form of innovation challenges the basic principle of innovation since it is not directly reproducible, whereas the process of codification and formalization described by the authors is part of cumulative learning, competence development and continuous adaptation and as such it is not true innovation, but part of the day-to-day functioning of a business (Windrum & Garçia-Goñi, 2008: 653). Similar problems also are faced with formalization innovation, since formalization is

seen as an important process in all forms of service innovation, but not an innovation in itself (Drejer, 2004; de Vries, 2006). With regard to discontinuity, the idea that service innovation should correspond to a significant shift, i.e. a long-run change and that is different from continuous adaptation to small changes seems largely shared in the relevant literature (Sundbo, 1997; Weinstein & Gallouj, 1997; Drejer, 2004).

However, these studies have not solved the problem to identify which elements or components affected by change in the overall service innovation process have to be univocally considered in assessing replicability and discontinuity. Our study proposed to choose organizational routines as the unit of analysis to assess both. Indeed, as "repetitive interaction patterns" organizational routines constitute stable entities and stability ensures that service innovation does not consist of specific, non-reproducible solution to a specific problem, but, conversely, results in a new stable and replicable delivery configuration (in terms of processes, systems and performance).At the same time, referring to routines for assessing the intensity of the realized change, we can precisely establish if it corresponds to a significant shift and interruption of an old routine system, resulting in a radical or incrementally new configuration, so distinguishing it from learning and competence development (Gallouj & Weinstein, 1997; Sundbo, 1997).

In this respect, the case study analysis showed that observing the authority process, although a number of dimensions in the service delivery system and process changed, innovation could be appropriately assessed by taking into account how all these changes had a true effect by changing the structure of organizational routines, i.e. the old routine system of the firm, resulting in a configuration that is inherently stable and then replicable. That configuration (that correspond to the ostensive structure of the service delivery routines) was able to incorporate all changes happened in others dimensions, that were viewed as second-order structures. When shifting to a new configuration, the actual change was the result of many interactional changes and reciprocal adjustment between and among a number of components that finally reached stability. After the entry in the new market, performance routines started to change because of a new service delivery system, i.e. new actors, new set of preferences, a new service concept and contractual formulas. Initially, replicability was difficult to obtain since a number of internal tensions arose with regard to informational and knowledge aspects of routines and local problems led to a contingent, improvisational approach (Moorman & Miner, 1998). In the

meanwhile, the ostensive dimension of routines modified and this did mean that a relative stability (and so replicability) was reached trough daily operative action. After that new changes were introduced in the vectors of technical characteristics by top management (starting after two years from the entry in the new market),a new enactment cycle led to a completely different configuration in the structure of delivery routines. Learning and adaptation were experienced during all the innovation process: when tensions were solved, full understanding of the process was possible and greater stability was reached. In this way, the new set of stable organizational routines was able to directly produce higher performances in term of overall productivity, i.e. producing economic value for the firm. In this respect, the strong link between organizational routines as interaction patterns and their economic impact is consistent with the recent findings in literature on organizational routines and performance (Becker, 2005; Becker & Zirpoli, 2008; Pavlov & Bourne, 2011).

The analysis of micro-change in the selected bundle of routines revealed that this kind of innovation did not simply stem from planned managerial action, but rather from the interaction between deliberate and emergent changes enacted in daily practices and routines and influenced by the operative agency of the firm's workers, repair shops and end users. This findings are aligned with the recent turn in service innovation studies describing innovation as not formalized or strategically planned but, on the contrary, emerging as part of everyday operations and practices of the service workers (Crevani, Palm, & Schilling, 2011; Dolfsma, 2004; Edvardsson & Haglund, 1995; Toivonen & Tuominen, 2009). In our case study we build on this literature and contributing to fill an important gap i.e. the need to gain a deeper understanding of the micro-dynamics of service innovation through studying and observing service workers in their everyday operations and interactions with external and internal actors (Crevani, Palm, & Schilling, 2011:190). We expressly adopted a "practice lens" focused on daily practices and routines (Orlikowski, 2000), bridging service innovation studies with an approach that frames innovation in service organizations as a complex "structuration process" (Giddens, 1984) characterized by interactions between deliberate and emergent changes in inter-firm and cross-firm delivery routines and in other components of the whole service innovation system. As in previous longitudinal work on organizational change, focused on daily practices and routines, (Barley, 1986; Orlikowski, 2000; Rerup &Feldman, 2011;

Schultze & Orlikowski, 2004) we distinguished between a "realm of action" and a "realm of structure" to re-organize and analyze traditional service innovation dimensions. In the new framework, the vector of preferences, that comprises pre-existing and new expectations, preferences and needs, acted as a medium between structure and action, being at the basis of both strategic and operative agency. Actually, during the enactment process of new performative routines, changes were initially evident only in some of these components (i.e. material and relational), whereas the others showed a substantial inertia to change. This led to some internal tensions into the structure of routines and some problems with the management of informational and knowledge-related issues. The subsequent cycle of deliberate changes would be initiated just to solve these tensions, although other tensions and problems would inevitably arise in the subsequent enactment phase.

Our general goal has been to create a fruitful dialogue between scholars in service innovation literature and scholars in organizational change and innovation who explicitly draw on a practice lens (Orlikowski, 2000) and an organizational-routine base framework (Becker & Zirpoli, 2008; Feldman & Pentland, 2003) to depict and analyze such a change. Curiously, in a number of studies of organizational change that adopt a "structuration" approach (Giddens, 1984), conclusions are based on longitudinal, explorative and inductive case studies that have been conducted, as in our specific analysis, in various service contexts (Barley, 1986; Feldman, 2000; Orlikowski, 1996; Rerup & Feldman, 2011). However, these studies do not aim at building a theory of service innovation and, consequently, the discussion is not anchored to the specific nature of services, as is our case. On the other hand, in traditional descriptive models of service innovation, the conceptualization of organizational change needed for attaining service innovation still remains understudied and in many respects controversial. We claim that such a literature can largely benefit from drawing on organization theory, by taking into account the precious insights that concepts such as organizational routines, structuration theory, and practice lens can provide to a clearer and more exhaustive conceptualization of service innovation.

4. ESSAY 3 - EXPLORING PATH-DEPENDENCE: TECHNOLOGY AND ORGANIZATION IN A CRITICAL REALISTIC PERSPECTIVE

Abstract

The concept of path-dependence has been largely adopted in management and organization theory to indicate how history matters in explaining strategic or operational persistence as well as lock-in states in organizations. However, only recently the relevant literature has "re-discovered" its original meaning and started to address its analytical and explicative power in a more systematic and fruitful way. The paper goes further in this direction through examining the path-dependence process that unfolds over time in an organization as the co-evolution of operational routines and related technology shape the self-reinforcing dynamics that gradually can reduce organizational adaptation capability. A critical realistic perspective is explicitly embraced since it is well-suited with a relational ontology and the need to explore the technological artefact in both its material and social dimensions. Furthermore, a morphogenetic approach is adopted to trace the temporal unfolding dynamics that embedded technology and routines so enabling to understand how they together shape the self-reinforcing dynamics that potentially leads to get stuck on a rigidified action pattern. Exogenous triggers in the development path i.e. strategic changes in structuring elements of technology and routines act as "perturbing" events in the self-reinforcing dynamics at work. Coherently with critical realism, technology is treated as a dynamic and changeable system where new components are gradually added or, alternatively, replaced to old ones during its temporal evolution, so exhibiting a variable influence on the self-reinforcing mechanisms. We tackle the research question through conducting a longitudinal, explorative and inductive case study in an Italian middle size service firm. The case analysis shows that a variety of combinations of technology-in-practice and routines-in-practice could emerge at the end of each social interaction cycle. However, the actual scope of action can progressively be reduced over time since human agency tend to exert less reflexivity when to face unexpected events or emergence situations. This can be explained because the self-reinforcing dynamics that operates at level of technology and largely due to managerial agency tends to overwhelm the path-breaking power of strategic changes in technology and routines, where a different self-reinforcing dynamics simultaneously works so impeding it to positively break down, i.e. creating room for new exploration and adaptation capability development.

4.1. Introduction

The concept of path-dependence has been largely adopted in management and organization theory to capture the more vague idea (Page, 1996) that history matters in explaining organizational phenomena, such as structural inertia, rigidity, stickiness, imprinting and lock-in states (Sydow et. al., 2009; Vergne & Durand, 2010; Castaldi & Dosi, 2011). Within evolutionary (Nelson & Winter, 1982) and behavioural (Cyert & March, 1963) theories of the firm, the construct has been powerfully applied to understand the irreversible nature of particular technological and organizational choices or behavioural patterns and to explain how path-dependent processes gradually lead organizations to get stuck on a specific path finally performing strategic or operational persistence (Sydow et. al., 2009; see fig.3). However, the logic of the very process producing organizational persistence remains under-explored, by and large (Schreyögg & Sydow, 2011) and scanty attention has been given to the self-reinforcing dynamics that underlines its temporal evolution. Indeed, self-reinforcement is a key mechanism in the path-dependence theory, as it was originally conceived in the seminal work of Arthur (1988) and David (1985). In explaining technological path-dependence at macro level, Arthur (1985) claims that, unintentionally triggered by a first random choice (i.e. a small event), a self-reinforcing process leads the range of decisional or action options to progressively narrow so that it becomes increasingly difficult to reverse the initial choice. At organizational level, path dependence means that doing things in particular way yields effects which pre-dispose the organization to do things in the same way the next time round (Coombs & Hull, 1997).

Building on the concept of increasing returns (Arthur, 1985; 1994) and positive feedbacks (Beyer, 2010), Sydow et. al. (2009) identify the most important self-reinforcing mechanisms that are likely to contribute to the development of organizational path-dependence: coordination effects; complementarity effects; learning effects and adaptive expectation effects.

Differently from previous management and organizational research, where path-dependence is given a vague and imprecise meaning and where the focus is mostly on the outcomes of path-dependent processes, more recent studies on such a topic (Beckman & Burton, 2008; van Driel & Dolfsma, 2009; Thrane et a., 2010; Valorinta et al., 2011; Kock, 2011) have started to adopt a process perspective and

systematically analyze its triggers, mechanisms and outcomes. In these studies, self-reinforcing mechanisms are explicitly take into account in explaining the path-dependent nature of organizational persistent outcomes. Furthermore, in these studies the concept of path-creation (Garud & Karnøe, 2001) is often integrated to that of path-dependence to indicate the active role of human agency in intentionally shaping the development of strategic decisions and organizational action pattern along a specific trajectory, so actively contributing to the path-building process. However, in these studies path-dependence analysis is mainly conducted at strategic level and regarding the organization as a whole, whereas not significant effort has been made to explore how path-dependence unfolds during daily routines carried out by people in an organization. Through explicitly embracing a practice lens (Orlikowski, 2000; Feldman & Orlikowski, 2012) organizational path –dependence can be observed at two intertwined layers or domains (Coombs & Hull, 1997): a) the organizational routines domain, i.e. the repetitive recurrent interaction patterns carried out in the firm for accomplishing tasks and conduct its regular business (Cohen et al., 1996; Feldman & Pentland, 2003; Pentland & Rueter, 1994); b) the "technology-as-hardware" domain, that comprises the specific technological objects or artefacts such as machinery, equipment, software, etc. that, regularly used to support and enhance organizational activities (Orlikowski & Iacono, 2001; Kroes & Meijer, 2006), play a key role in organizational routine dynamics (Pentland and Feldman 2005; D'Adderio, 2011; Leonardi, 2011).

Our work aims at contributing to organizational research on path-dependence through tackling the following research question: "How the co-evolutionary paths of technologies and routines shape the self-reinforcing dynamics that can lead to reduced organizational adaptation capability? ".

To this end we shall embrace a critical realistic perspective (Bhaskar, 1978) since it is well-suited with a relational ontology and the need to explore the technological artefact in both its material and social dimensions. In addition, a morphogenetic approach (Archer, 1998) is adopted to trace the temporal unfolding dynamics that embedded technology and routines so enabling to understand how they together shape the self-reinforcing dynamics that potentially leads to get stuck on a rigidified action pattern.

The paper is structured as follows. In the next section we firstly review how existing research has separately addressed path-dependence in the domains of organizational

routines and technology-as-hardware. Then we discuss about their co-evolutionary processes of path-building and show the advantage of adopting a critical realistic les to unravel the self-reinforcing dynamics at work that simultaneously affect technologies and routines. Subsequently, we describe the adopted methodology, addressing the specific research design issues of case selection, data collection and analysis. In the last sections, we present the empirical results and provide the discussion and conclusion.

Fig. 3 Organizational path-dependence
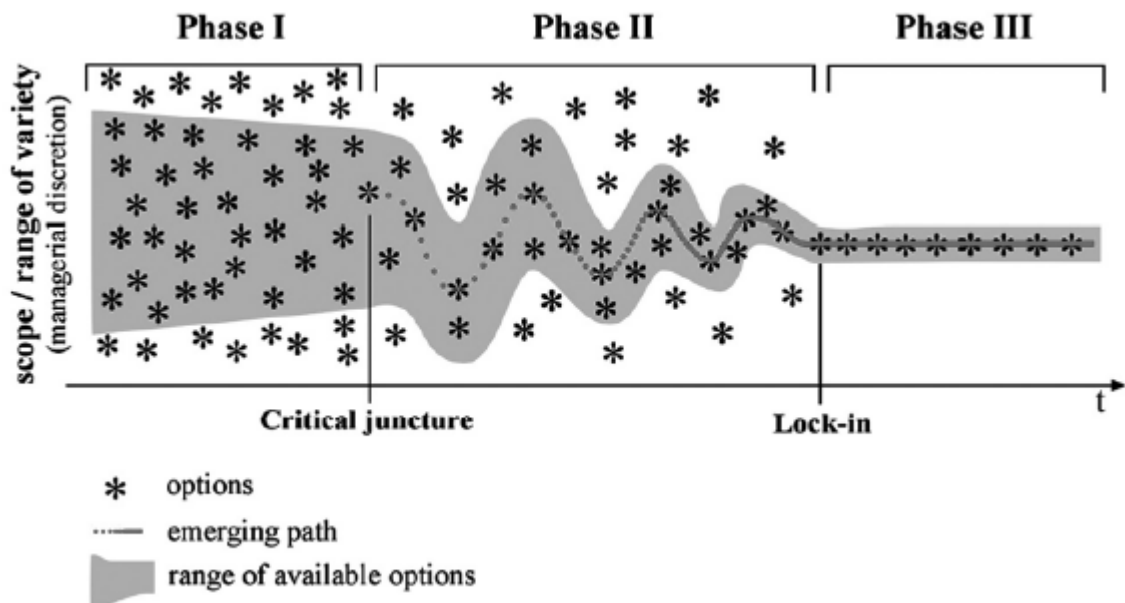
Source: Sydow et al., 2009

4.2. Theoretical background

4.2.1. The path-dependent evolution of organizational routines

Both evolutionary (Nelson & Winter, 1981) and behavioural theories (Cyert & March, 1963) of the firm have recognized that organizational routines develop in a path-dependent manner. At strategic level, studies in the resource-based and capability-based view traditions (e.g. Helfat, 1994; Teece et. al., 1997; Leonard-Barton, 1992; Cohen & Levinthal, 1990) have argued that the accumulation of routines and capabilities evolve along a specific development path and showed how path-dependent processes can be a source of cognitive inertia (es. Tripsas & Gavetti, 2000), structural rigidities (e.g. Leonard-Barton, 1992) or lock-in states (Tushman & Anderson, 1986; Henderson & Clark, 1990). Literature on organizational learning (Argote, 1999) has explained that path-dependence in routines is due to the

incremental and cumulative nature of learning processes that can potentially lead to "competency traps" (Levitt & March, 1988).

Empirical studies on the path-dependent development of organizational routines are still scanty. On the one hand, the existing literature only indirectly contributes to the path-dependent theory, since the term, when is present, is mainly used in a metaphoric way for example to underline that previous experience matters in explaining decision-making routines (Levinthal and March 1981; Betsch et al., 2001; Robinson & Meier, 2006), the incremental nature of routine development (Feldman, 2000) or, alternatively, to explain other resulting phenomena such as routine rigidity (Narduzzo et al., 2002), structural inertia (Gilbert, 2005) or institutional lock-in (Barley & Tolbert, 1997). Furthermore, in more recent studies (Feldman, 2000; Feldman & Pentland, 2003; Howard-Grenwille, 2005) the idea that routines can change endogenously and the emphasis of human agency is consistent with the idea of path-creation and path-breaking (Garud & Karnøe, 2001). However, in all these studies the reason behind specific initial choices (Becker, 2004) as well as the mechanisms through which initial conditions or chance events trigger a self-reinforcing dynamics at work during routine reproduction remained largely unexplored. In this respect, literature on organizational routines has recognized that feedback effects play a key role in explaining path dependent development of routines (Becker, 2004). Indeed, positive performance feedbacks can be viewed as a mechanism of the self-reinforcing dynamics that can lead organizations to accumulate more experience (i.e. learning) with a specific procedure although it could not correspond to the most appropriate solution (Levitt & March, 1988). This can help to explain how routines get stuck on a specific development path. As a result of learning effects, the efficiency with a particular procedure increases with its use and organizations learn to refine their skills on the procedure that they use. This does mean that "differences in success with different procedures reflect not only differences in the performance potentials of the procedures but also an organization's current competences with them" (Levitt & March, 1988:322). As Sydow et al. (2009:700) claim "the more attractive the chosen solution becomes because of accumulated skills and decreasing cost, the less attractive is to switch to new learning sites". Indeed, self-reinforcing learning effects are not the only mechanisms at work at organizational routine level. In elaborating a framework linking organizational routines characteristics to its antecedents and outcomes, Becker (2005) suggests

coordination effects and cognitive savings effects as the main performance outcomes of routinization. These effects work as performance-revealing feedbacks (together with learning effects) and can be considered as underlying mechanisms of the self-reinforcing dynamics that progressively reduce the pool of available or searched routines so constraining operation to adhere to a specific action pattern. Coordination positive effects derive from the more efficient interaction among actors as the number of participants adopting a specific rule or routine increases (Sydow et. al., 2009). In other words, they confer advantages to 'going along' with other economic agents taking similar actions (Arthur, 1988). Cognitive saving effects are indeed strongly related to learning effects and can be viewed as an integral part of them. These result from the benefits of following the chosen solution since gradually operation becomes less mindful so requiring lower cognitive effort (Becker, 2005; Levithal & Rerup, 2006). Finally, complementarity effects and adaptive expectation effects are only theoretically discussed with regard to routines (Sydow et. al., 2009) but not yet empirically investigated. More specifically, complementarity effects create path-dependence in routines since it becomes more attractive to exploit the existing synergies or save misfit costs caused by operational solutions deviating from the established routines; on the other hand, adaptive expectation effects derive from the will of organizational members to adopt the same routines since they expect that others to do the same (Sydow et. al., 2009:699). Expectations can be identified with ideas and beliefs that individuals share about a particular way of doing things and that are externalized as evaluation routines (Garud & Rappa, 1994) that they use to judge established action. Adaptation means that as specific action patterns are reproduced, evaluation criteria about positive performance tend to be modified in accordance with those patterns and this tend to reduce the probability of searching for alternative and potentially better solutions.

Overall, the brief literature review showed how we still need to advance our knowledge about the micro-analysis of how path-dependent processes unfold at the level of organizational routines and in particular to investigate how the described performance-revealing effects work, potentially in conjunction, in the self-reinforcing dynamics.

4.2.2. The path-dependent evolution of technology

Originally, the concept of path-dependence was largely adopted with specific regard to technology in order to explain why and how a technological standard or design achieves dominance at industry or market level (Arthur, 1994; Dosi, 1982; David, 1985). However, in this studies, technology is defined in broad terms as a set of pieces of knowledge, some of which are embodied in physical devices and equipment and the "battle" was among competing technologies sponsored by firms (Suarez, 2003). Increasing returns and network externalities have been proposed as the main self-reinforcing mechanisms explaining technological dominance and lock-in. Next to utility-based evaluations, the influence of socio-political processes in the setting of technology standards has also been recognized in technology management literature (Garud et. al., 2002; Tushman & Rosenkopf, 1992).

Within firms, the concept of path-dependence in technology has been employed to indicate that "history matters" in explaining technology-related choices i.e. investment in specific "technology-as-hardware" made by management (Coombs & Hull, 1997; Murman & Frenken, 2006; Valorinta et al., 2011). More specifically, it is used to explain two situations: a) once made an initial technological choice, firms tend to be reluctant to replace or modify existing technologies (e.g. tools, software, information systems). Accordingly, upgrading of hardware and specific functionalities without radical changes to the main features and data structures are the most preferred future investment options (Valorinta et al., 2011); 2) existing technologies influence the pay-off for future technological choices. A new technology investment may interact with current technological artefacts in a positive way, i.e. providing the firm with synergy and a new "window of opportunity" (Tyre & Orlikowski, 1994) or negatively, because of "undue persistence" (Garud & Van de Ven, 1992). In both cases, the resulting technological rigidity can be explained through a number of reinforcing mechanisms, such as sunk costs, the accumulation of experience, network externalities, economies of scale, informational increasing returns, technological inter-relatedness (Read, 2000). Indeed, inter-relatedness and complementarity effects can potentially regard not only different artefacts but also technologies and organizational processes and routines (Reinstaller & Holzl, 2009). Finally, cognitive constraints deriving from scanty managerial attention (Ocasio, 1997), adjusting expectations to lower performance effects (Cyert & March, 1963) as well as myopia (Levinthal & March, 1993) can also help to explain firms'

technology search investments patterns leading managers to ignore alternative although better technological options (e.g. Tripsas & Gavetti, 2000) or how evaluation routines designed to judge specific artefacts can reinforce existing beliefs (Garud & Rappa, 1994; Faraj et al, 2004).

However, organizational path-dependence in the technology layer is not only visible at the strategic investments level. Indeed, once made a specific technological choice, a given technology-as-hardware is implemented in a specific area in the organization, inscribing the beliefs, goals and expectations of managers (and developers) as they are embedded in its material components. During the adoption stage, users exercise their agency to enact a specific technology-in-use, so conditioning the further development path of technology. In organizational studies on technology, constructivist theoretical approaches have been adopted to assess the social dynamic of technology evolution. More specifically, actor network theory and other theoretical insights from the so-called STS tradition have been largely employed to explain the dynamic that leads to the institutionalization and stabilization of a certain technology (Pinch & Bijkers, 1987; Latour, 2005). However, in these studies the focus is on the development stage of the technology cycle, so that the self-reinforcing dynamics underpinning technological path-dependence during the enactment stage has remained completely ignored. Organizational studies focused on the enactment stage (e.g. Barley, 1986; De Sanctis & Poole; 1994; Orlikowski, 1992; 2000) draw on Giddens' structuration theory to show the unfolding nature of technology and how its identity is shaped through its use in organizations. Although not explicitly stated, these studies revealed that, once embedded in daily practices and interactions, the emerging technology–in-use creates path-dependence and influence the subsequent technology development. As for the scope of action, operative agency can initially draw on a variety of technologies-in-practices, experimenting with and modifying their technological artifacts in use, skills or work procedures (Orlikowski 2000). However, technological adaptation only happens for a short time after implementation, a " window of opportunity" (Tyre & Orlikowski, 1994), since a variety of mechanisms at work during repeated behaviour tends to prevent further changes. In their study, learning effects and adaptive expectations effects, i.e. mechanisms underlying path-dependence, working in conjunction with production pressure and erosion of team enthusiasm produce the rapid freezing of a specific technology-in-use. The authors also highlight that exogenous or unexpected events

such as the addition of new machines or tools, the release of a new system or the breakdown of an existing one, new requirements and procedures and managerial action can potentially triggers positive changes revealing themselves as true path-breaking events. Indeed, in all these cases users can refocus attention, develop new rules to deal with novel situations, discovering that the modifications prove useful additions to his regular wok routines (Tyre & Orlikowski, 1994). However, whether and why a new window of opportunity is exploited in subsequent enactment stages remained empirically unexplored and as such it offers us an interesting research opportunity. From a theoretical viewpoint, it is expected that when the exogenous events consist in the addition of new artefacts, since they are more tightly coupled together in larger technological systems or infrastructures, the degrees of freedom available to users to experiment with and modify their technological artifacts is reduced (Orlikwoski, 2000). This means that higher complexity of the overall technology system and the increased number of constituting components can influence the self-reinforcing dynamics that explains path-dependence. This seems especially plausible for ERP systems that are notoriously inflexible because of their integrated nature (Kallinikos, 2004) as well as for software artifacts (D'Adderio, 2003) where the "power of default" is very high. However, empirical research (Boudreau & Robey, 2005) has showed that also the introduction of new complex and inflexible technology can be an occasion of improvisation, reinvention and unanticipated practices. This counter-proving results invite us to push further our understanding of how users' agential reflexivity - that is able to positively break down the existing technology-in-use - is influenced by incumbent artefacts and how they interact with new ones in a path-dependent manner. Indeed, we can presume that on the one hand the specific nature of technological artifacts and their material dimension influence the number of possible technological options among which operative agency can choose; on the other hand the actual exploitation of new adaptation and exploration opportunities happens in relation to the interaction of unexpected events with the already self-reinforcing dynamics at work. Subsequently, when a new "technological" event (i.e. the addition of a new tool, the breakdown of an old system,) happens, it can triggers positive change, i.e. works as a path-breaking event but, conversely, can also foster further restriction of search efforts and the consequent reduction of organizational adaptation capability.

4.2.3. Unravelling the self-reinforcing dynamics at work: the technology and routines' co-evolutionary paths through a critical realistic lens

In a process theory of organizational path-dependence (Schreyögg & Sydow, 2011), critical realism (Bhaskar, 1978) and specifically a morphogenetic approach (Archer, 1998) can provide an useful theoretical perspective to unravel the co-evolutionary paths of technology and routines, helping to understand the social dynamics governed by self-reinforcing or, alternatively, path-breaking forces (fig.5).

Within organizational studies, a critical realist position (in both ontological and methodological terms) has been contrasted to other theoretical approaches, such as actor network theory or structuration theory since it provides a layered social ontology that is much better placed to understand the interplay between structure and agency (Reed, 1997). Indeed, in these approaches agency and structures tend to collapse into localized or micro-level social practices and social structures have no ontological status or legitimate explanatory role in organizational analysis. In critical realism, agency and structure are ontologically interdependent but they remain essentially distinct, possessing emergent properties distinct from the social interaction level. Drawing on Bhaskar's work, Archer (1998) formulates her "morphogenetic" approach to explain how the previous activities of human actors create structures (institutions, roles, routines) that then both constrain and enable actors in the next round of activity (Mutch et. al., 2006:615). As she explains, every morphogenetic cycle distinguishes three analytical phases consisting of: a) a given conditioning (but not determining) structure; b) social interaction; c) structural elaboration or modification, that is to a change in the relations between parts constituting structure. So, in each cycle, actors begin their interactions in a context which they did not create but which enables certain outcomes and make others unlikely or difficult. In these circumstances, agency is not determined by context, but has to take into account opportunity cost in exercising choice, although certain courses of action can be practically unavailable in many contexts (Much et al., 2006:615). Archer's development of critical realism, therefore, preserves a strong commitment to a relational form of analysis in which agency and structures have to be held apart to explore the nature of both, and the relationship between their unfolding development over time (Mutch et al., 2006:616).

In organizational studies on information systems (IS) critical realism has been increasingly applied (Mutch, 2010). It has been contrasted to other constructivist

approaches, including structuration theory, institutional theory and actor network theory, since they tend to ignore or technology or agency whereas technology itself is often treated as a unitary object, ignoring each technology's distinctive characteristics (Volkoff et al., 2007) and materiality (Monteneiro & Hanseth, 1996). Critical realism is helpful in opening up the "black box" of technology because of recognition of materiality and because of the notions of stratified ontology and emergence (Mutch, 2010). Technology is viewed as both emergent and dynamic. In addressing its materiality, Mutch (2010) consider it as constituted of particular combinations of levels and features, i.e. data structures, software and hardware. According to the author, the need is to be more specific about the levels and features of technology and the intention of a morphogenetic approach is to trace the relationship between material properties and the agential interpretive flexibility.

Since critical realism incorporates a temporal aspect, it fits well with a change process, which by definition occurs over time (Volkoff et al., 2007). A morphogenetic approach can be adopted to trace the temporal unfolding dynamics that embedded technology and routines so enabling to understand how they together shape the self-reinforcing dynamics that potentially lead to get stuck on a rigidified action pattern. Exogenous triggers in the development path i.e. strategic changes in structuring elements of technology and routines can be viewed as "perturbing" events in the self-reinforcing dynamics at work. Within this, technology constitutes a dynamic and changeable system since during its temporal evolution new components are gradually added or, alternatively, replaced to old ones, so exhibiting a variable influence on the self-reinforcing mechanisms. According to Greener (2006), a main advantage of considering insights from the morphogenetic approach to study path-dependence is the importance that it attaches to history. "There is a genuine sense of the role of history in each morphogenetic cycle we analyse – we see the interaction between pre-existing ideas and structures and human actors unfold before us". In a morphogenetic-inspired model of path dependence, forces for change can come endogenously or exogenously or both and the resulting system can become more morphogenetic (generating change) or morphostatic (generating continuity).

Fig. 5: The morphogenetic cycle
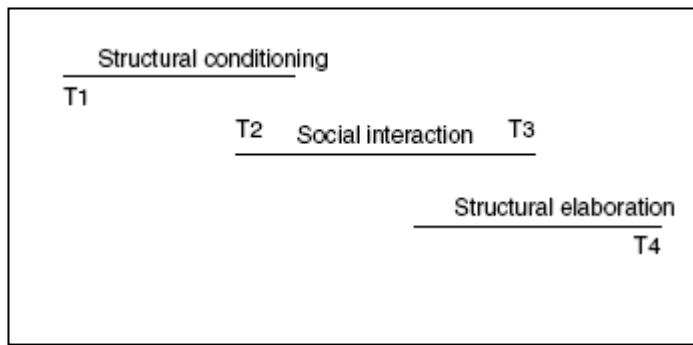
Source: adapted from Archer (1995:82) in Mutch (2010:509).

4.3. Method

We chose the research design according to the nature of the specific research question that we want to address. Existing theory has recognized that organizational path-dependence is a multi-layered phenomenon, visible at the level of organizational routines and technology. However, extant research has not yet offer a satisfactory answer to the question how path-dependence (or path-breaking) works at micro-level and the complex self-reinforcing processes that simultaneously influence organizational routines and technology evolution over time still remain not fully understood. Accordingly, we chose to carry out an in-depth qualitative case study (Eisenhardt, 1989; Pettigrew, 1990; Yin, 1994) that is particularly suited for "how" questions and to understand complex social processes.

We collected data in in Drive Service (DS), an Italian middle-sized service firm holding a leading position in the fleet management sector in Italy, and we based our analysis on qualitative process data (Denzin & Lincoln, 1994; Langley, 1999; Miles & Huberman, 1994). In particular we focus our attention on the complex processes of innovation and change that simultaneously affected many technological and not-technological components of a core business process (called "authority") between the period 2008-2011.). We apply a practice lens (Orlikowski, 2000) and an organizational routine-based framework (Becker, 2004; Becker & Zirpoli, 2008) so that our unit of analysis, i.e. co-evolutionary changes in technology and organizational routines become transparently observable (Eisenhanrdt, 1989; Pettigrew, 1990).

4.3.1. Case selection[4]

The firm has been selected according a theoretical sampling criterion (Eisenhardt & Graebner, 2007). In 2004, the firm undertook a deliberate strategy of rapid growth, simultaneously pursued externally (through acquisitions), and organically (through the entrance in new markets and the development of radically new services). Starting from 2006, Drive Service won competitive tenders for long-term contracts with some big customers in the Public Administration (PA) market (mainly the law enforcement agency and the security force). Such market innovation not only led to a predictable increase in the production volume of fleet management services, but marked the beginning of complex and interactive innovation and change processes, that simultaneously affect both technologies and organizational routines.

Within the complex fleet management offerings, we focus on a specific typology of maintenance services, historically constituting a core business component of the service portfolio. Maintenance services are arranged according to a modular product architecture that comprises a number of both planned preventive and corrective maintenance services to vehicles covered by contract (tear-off coupons, breakdown repair, oil fill ups, etc.), along with remote customer service and periodic statistical reports. The Maintenance Unit, whose office was initially located in one geographical site (Milan), was subsequently split down in two different organizational offices respectively located in north and middle Italy. Maintenance services are delivered throughout the country (predominantly Central and Northern Italy) relying on a widespread network (around 12.000 service points in 2008) of machine shops, body repair shops and tyre-dealers. As to related activities, DS does not aim, unlike other actors in the automotive value chain, at maximizing profits from selling services complementary to vehicles (i.e. maintenance), but at optimizing the trade-off existing between the firm's operational efficiency and service level expectations for both customers (i.e. corporate firms) and end users (i.e. who drives a car). Indeed, its core competence consists in guaranteeing satisfactory operating and safety conditions for managed vehicles. At the same time, high operational efficiency is crucial to achieve this goal through minimizing overall service maintenance costs. DS is especially reliant on its personnel for competitive advantage through leveraging their expertise and technical competence. Before entering the new market, workers in the Maintenance Unit had been apprenticed to repair shops for a long

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[4] For more details about the research setting, see also the II essay.

term developing technical skills and specialized know-how through practice as well as sharing tacit knowledge in executing their daily tasks.

Since we intend to observe how self–reinforcing mechanisms work at the level of technology and routines, we carefully selected a process that witnessed visible transformations over time, both in its organizational and technological structures, triggered by the growth-driven market innovation process we reported above. After a preliminary round of interviews with top managers at DS, specifically designed to identify an appropriate object of investigation, we selected the so-called maintenance authority process. As the term suggests, authority is a complex process including a number of activities, mainly executed by staff in the Maintenance Office, aiming at release an authorization to official repair shops to effectively repair the vehicle. Indeed, whenever an end user brings his or her car to a repair shop, this has to put it an estimate for the firm, irrespective of the nature and number of maintenance performances required to re-establish correct working and safety conditions. To accomplish their tasks, before entering the Public Administration segment, the firm's staff especially relied on their expertise and organizational tacit knowledge as well as the formal knowledge codified in a home-grown system. This routine system would be challenged by the cited market innovation and organizational growth dynamics.

4.3.2. Data Collection

Data gathering covered the period 2007-2011. The main fieldwork phases lasted from November 2007 to March 2008 and from June to December 2010, with a focus on the last seven years of the firm, starting from 2005. Data was collected through semi-structured interviews, archival material and participant observation. A total of 26 semi-structured interviews were conducted with current and former top and middle management. Interviews lasted from 30 minutes to three hours and were all taped and transcribed. The first round of interview (totally 18) consisted of more open ended questions aiming at gaining a complete understanding of the business model of service maintenance services, the structure and functioning of the service delivery system, the main strategic decisions and deliberate changes in organizational structures, processes, technologies and management systems as a consequence of the market innovation and organizational growth. Two of the authors interviewed people at the top and middle levels in the organization hierarchy and from different functional areas so as to gain a thorough understanding of how the

emerging theoretical constructs interrelated (Strauss & Corbin, 1990). Both during and after this research stage, we integrated primary data source with studied archival material in the form of firm-specific documents (i.e. top management meeting presentations, project reports, strategic development plans, minutes, organizational charts, BPR consultancy reports) in order to gain a more complete picture of deliberate changes in traditional service innovation dimensions.

In the second main research phase, one of the author spent two months (June and July 2011) in the Maintenance Office in Rome as a research observer, focusing attention on daily practices and operations as they were carried out by workers. In this stage, the focus was on the selected bundle of maintenance authority delivery routines and inherent changes. Through work-shadowing and prolonged engagement in the field the first author could gradually familiarize with the process and make workers feel comfortable at talking about their tasks, the organization of work, intra-office and inter-office interdependencies, supporting technologies, as well as at retrospectively telling about main deliberate and emergent changes in such dimensions. All collected field data were transcribed in the form of field notes and re-written in Microsoft Word documents at the end of each day. Observation was also integrated by a number of office-specific documents (i.e. copies of contracts with clients and suppliers, written estimations, statistical reports, e-mail communications, informal division of labor schemes, technical manuals). In this phase semi-structured interviews were conducted with a carefully selected set of informants, diverse in terms of hierarchical levels and functional areas, and chosen according to the following criteria: i) the nature and intensity of linkages with maintenance services and the authority process; ii) the historical position in the firm; iii) the level of knowledge about the evolution of changes in the service delivery systems, processes and performance. Whenever possible, we interviews key informants more times so as to maximize the sensitive information we could obtain from each of them, whereas the mix of informants provided us with personal accounts of individuals who experienced the innovation process at different times and from different vantage points and at the same time contributes to minimizing the retrospective sensemaking bias (Eisenhardt & Graebner 2007; Golden, 1997). Through the use of multiple collecting methods we could triangulate data (Denzin & Lincon, 1994; Jick, 1979), whereas the prolonged engagement in the field helped us to catch the complexity and richness of the research context (Dyer & Wilkins, 1991)

as well as to immerse ourselves in a deep retrospective understanding of the innovation process evolution and organizational routines changes. Altogether, both procedures enabled to secure the validity of results (Creswell & Miller, 2000).

4.3.3. Data analysis

In order to examine the co-evolutionary paths of the technological artefact system and organizational routines and understand the role simultaneously played by technology and routines in the self-reinforcing dynamic that can explain path-dependence or path-breaking we rely on the transformational model of social activity (TMSA) described by Archer (1998) and adopted in organizational studies on technology in general (Lawson, 2003; Faulkner & Runde, 2009) and information systems in particular (Volkoff et al., 2007; Mutch, 2010) to trace four consecutive morphogenetic cycles, each instantiated by the specific deliberate decisions made top management with regard to technological investments in the organization. More specifically, the analytical focus will be on the temporal evolving technological system constituted by the set of artefacts directly involved in the production and delivery of a selected bundle of routines constituting the so-called "maintenance authority" process. Accordingly, we will describe the following technological "shifts" mainly introduced in the Maintenance Office and related to the authority process:

1) the introduction of fax technology - in addition and partial substitution to the telephone artefact - to carry on authority tasks;

2) the introduction of a ticketing system (Help Desk Advanced or HDA) to electronically manage authority claims;

3) the replacement of a home-grown system with a specific module of an integrated system (SID) to control and authorize maintenance operations on vehicles;

4) the complete breakdown of HDA and its replacement with a workflow module of an integrated software platform for knowledge management applications (JOSH).

Through mapping the evolutionary path of managerial choices with regard to authority-related technologies we can understand path-dependence in the "technology-as-hardware" layer of the organization as a consequence of strategic

choices. In fact, we are able to explain how future investments decisions are influenced or constrained by those that have been previously made and, in doing so, we can identify which specific feedback mechanisms at work progressively reduce the freedom - for top management - to choose among technological solutions in supporting the execution/control of the authority process. However, we are particularly interested in technological path-dependence as a phenomenon as it unfolds at the level of practice: in the structural conditioning phase of each morphogenetic cycle, the specific beliefs, expectations and goals of top management (and technology suppliers/developers), as they are inscribed in the physical (material) aspects of each technological artefact, are made visible to people who will routinely use it to carry out their work (in our case to the authority team). In this stage, the deliberate addition/substitution of a new technological component to a dynamic and increasingly complex system corresponds to a modification in the underlying conditioning structure, that is inherently "past-dependent", since it depends on previous technological choices made by top management. At same time, acting as an exogenous event at the meso-level of practice, it acts as a "perturbing" factor triggering a new structuration cycle that can either generate change (i.e. corresponding to more morphogenetic) or continuity (i.e. corresponding to more morphostatic). In the first case, the new technological artefact, through embedding in organizational routines as well as in already used artefacts, gets a specific identity that actually contributes to path-breaking (although this can always happen in either an expected or unexpected direction); in the last case, it tends to reinforce previous patterns of use through a self-reinforcing dynamics, contributing to reduced exploration and adaptation, i.e. moving potentially towards organizational inertia and a lock-in state. In this respect, further technological choices can play a key role in breaking down such a potentially dangerous situation.

The structural conditioning state: the materiality of technology and routines and other structures

Structural conditions are the outcome of the interaction between the material and social features constituting technology that emerges as the socio-material context within which its future use will occur (during the social interaction stage). More specifically, consistently with a critical realist ontology, technology is firstly conceived as a technical artefact (or object) made by humans and consisting of a

number of physical features (mass, volume, texture, etc). Materiality, however, involves more than the concrete physicality of particular technologies (Mutch, 2010) and includes also their packaging, arrangement and appearances as well as the interface through which users can interact with them (Markus & Silver, 2008) i.e. that constituting the so-called surface structure (Weber, 1997, in Strong & Volkoff, 2010) and influencing the usability of technology (Wand & Weber, 1995; Strong & Volkoff, 2010). All together, the material (including physical) features constitute the "form" of a technological object (Kroes & Meijer, 2006).

On the other hand, technology is conceived as a tool (Orlikowski & Iacono, 2001) for certain uses and, accordingly, it consists of a bundle of functionalities available to future users to support processes. In Giddens' (1984) language, technology is a structural conditioning element as it constitutes a bundle of resources (and capabilities). Furthermore, in the case of information systems, functionality is associated to data structures, since technological capabilities are expressly oriented towards data manipulation (storing, extraction and transfer, information-processing, etc.). If we assume that the function of a technological object (and related data structures in the case of the IT artefact) is an agentive property imposed by social groups in pursuit of practical interests (Faulkner & Runde, 2009), in each structural conditioning stage a distinction should be made between technological artefacts not previously used in the organization and already existing ones. In fact, consistent with a systemic view of technology, at the beginning of each morphogenetic cycle we have to consider the structural conditioning influence as a result of combining existing and newly introduced artefactual components. As for the last ones, specific functions are those imposed by managers, designers and/or developers, whereas existing artefacts, as they were used in the previous morphogenetic cycle by specific group of users, inscribe the functions they sustained in the technological object concerned leading to its stabilization and closure (Pinch & Bijker, 1987). It is worth highlighting that the assignment of functions as well as the material properties of technology are not always the result of a deliberate or conscious effort. For example, frequent crashes, triggering errors and "defaults" preset values are example of possibly unintended technology properties (Markus & Silver, 2008) whereas users often contribute to sustain a specific function as an unintended consequences of activities in which technology is adopted (Faulkner & Runde, 2009). Since the temporal unfolding of technology in the organization is conceived as the change in

the combination of the material and functional features of a bundle of artefacts we can understand how specific instantiations of such a technological system over time contribute to path-dependence. Functions (and data) corresponds to deep structures, i.e. "scripts that provide a representation of real-word systems" (Wand & Weber, 1995) while their assignment to technology, consistently with a TMSA perspective, corresponds to a "social rule" (Faulkner & Runde, 2009), i.e. a procedure that specifies how objects with certain material characteristics should be used in specific situations, i.e. its purposes and ways of functioning (corresponding to technological facilities in Giddens' language). Indeed, since technological artefacts can often be viewed as tools supporting organizational processes, in the structural conditioning stage the more general social rules just mentioned should be considered in conjunction with the more specific procedures that articulate and explain in detail how related organizational routines should be executed through the concerned technology (Volkoff et al., 2007), i.e. those corresponding to the ostensive dimension of routine (Pentland & Feldman, 2003) and that, like technological artefacts, can have a material dimension in the form of standard operating procedures, graphical representations, manuals, flow-charts, process-related documents.

Next to structural conditions related to the functional domain, we should also include second-order structures that, although belonging to the real domain and existing as part of the delivered technology separately from its use, are "latent" (Strong & Volkoff, 2010) i.e. not explicitly scripted in the material features of technology. These structures correspond to the set of assumptions, expectations, intentions, values and goals built into the technology (e.g. in data, hardware or software subsystems). They underlie the surface and deep structures and express the norms of conduct and elements of the organizational culture that should be reproduced in using the concerned technology, the organizational benefits expected from its adoption, the assignment/re-assignement of power, authority and control enabled by technology implementation (corresponding to Giddens' norms and interpretive schemes). Similarly to functions, these dimensions of technology act as structural conditions at the beginning of each morphogenetic cycle as assigned from different social groups, mainly managers and developers (for new implemented technological artefacts) but also users (for already used technological artefacts). Actually, in this last case the established technology has reached its stability and a "for-now" closure (Orlikowski, 2000) in terms of latent structures also incorporating users'

assumptions, expectations, values and goals as they formed, changed and evolved during the social interaction stage through interacting and repeatedly using the new artefact and existing ones. We agree with Strong & Volkoff (2010) in arguing that for each new technological investment choice made by management, it is plausible that not all the roles, controls and cultural norms (constituting latent structures) are explicitly considered or known as the technological artefact was design and that, conversely, they become apparent only during the artefact use. However, we do not agree with the authors in claiming that all second-order structures, corresponding to expectations, values and goals in terms of roles, controls and culture are "latent" in the sense that they are not deliberately planned or known when the artefact is designed. Instead, we claim that what is important, consistently with a relational ontology, is the perception of these structures by future users during the social interaction stage,. It is clear that these structures enable and constrain how roles are designed, how control can be exercised and the overall culture of the organization. As Orlikowski (1992) says "human agents build into technology certain schemes (rules reflecting knowledge of the work being automated), certain facilities (resources to accomplish work) and norms (rules that define the organizationally sanctioned way of executing work)". Once made durable, technology configurations form part of the objective context for future action and once installed, there are a number of constraints at the various levels of technology (Volkoff et al., 2007; Mutch, 2010).

The social interaction stage and the emerging technology and routines-in practice

The introduction of a new technological artefact is not a plug-n-play type of process and is ongoing long after implementation, adoption, and adaptation (Leonard-Barton, 1992; Tyre & Orlikowski, 1994; Orlikowski, 1996; Baxter & Barente, 2010). People can (and do) redefine and modify the meaning, properties and applications of technology after development (Orlikowski, 2000: 406). Furthermore, new technological artefacts frequently need to co-exist with incumbent those that are already incumbent to the practice (Baxter & Barente, 2010). During this stage, users start to perform organizational routines and their evolution and change is influenced by the previous structural conditioning phase (Volkoff et al., 2007; Mutch, 2010). In this stage the structures inscribed in technology are relevant to explain path-

dependence since they have causal potential. However, the causal potential of technology does not simply depend from the structures embedded in it before use but from "functional affordances" and "symbolic expressions" (Markus & Silver, 2008). Indeed, affordance identifies what the users may be able to do with the object, given their capabilities and goals. Similarly, symbolic expressions is a relational concept bridging the artifact and how users may interpret it, assigning it a particular meaning, intents and values. The IT artefact, through embedding second-order structures that can have not be explicitly considered in the design stage and so not scripted in the material form of technology, influence users' impressions of systems. However, users engage in a process of interpretation and social construction with respect to technology, so that the specific meanings, intents and values assigned to technology are unfolding and emergent properties from the "mangle of practice" (Pickering, 1993). Furthermore, in this stage the material aspects of technology constrain the performative and the ostensive (Pentland & Feldman, 2008; Volkoff & Elmes, 2007) but its intensity depend on the completeness and accuracy with which structures have been scripted in the material form of technology or also, synergically, in other artefacts such as procedures and process-related documents (and other outputs of the concerned technology system). In each cycle of social interaction, the situation is more complicated if we consider that IT implementations rarely involve "greenfield" sites (i.e. new organizational units or organizational units without incumbent IT where the transition is from a first generation of manual and paper-based processes to digitization and automation) and consequently such a stage is influenced by the interactions between the new and incumbent IT artifact that needs to be added or has to displace a well-established ones to become embedded in practice (Baxter & Barente, 2010). Once embedded in practice, the use of the tool becomes taken-for-granted – hidden in the action or "read-to-hand" (Knorr-Cetina, 2001; Leonardi, 2011). In general, individuals respond to novelty by anchoring it to the familiar and this means that when there is no strong familiarity to a particular system a user may be able to transition much more easily (Baxter & Barente, 2010).

In enacting a specific technology-in-use, the concept of "interpretive flexibility" is highly used (Orlikowski, 2000; Boudreau & Robey, 2005). According to a realistic perspective, the role of interpretive flexibility is not downplayed (Mutch, 2010) but it is said that interpretive flexibility is not infinitively malleable and that it is influenced by the material form of technology, as well as the materiality of previous practices

(Orlikowski, 2000). Through exercising agential reflexivity to a variable degree, users can replicate familiar use of technology or also invent new ones, so determining the emerging features of technology-in-use and routines-in practice at the end of each morphogenetic cycle. According to Leonardi (2011), people can decide to alternatively change technology or organizational routines. Specifically, when they perceive that technology cannot enable to achieve their goals they decide to change their routines so they could still achieve their goals. Otherwise, they can perceive that the technology affords them with new possibilities and new goals and in this case they decide to change technology. Path-dependence is created through consecutive "imbrications" cycles, that influence the construction of perceptions of affordance and constrain creating a space of opportunity or frustration in which people are motivated to act producing changes in routines or technologies.

4.4. Empirical results

4.4.1. The transition from telephone to fax technology

The introduction of fax technology in the Maintenance Office marks the transition from a first generation of "direct and verbal" to "indirect and paper-based" authority-related organizational routines.

The artefact system-in-practice before technological change

Incumbent technical artefacts – viewed as the component parts of the technological system in question – essentially included the telephone and a home-grown information system (called IDRA). Through an automated contact center, incoming calls from suppliers (i.e. assistance network agents including mechanics, panel beaters or tyre-dealers) were routed directly and randomly to a staff member of the Maintenance Office who subsequently individually handled the authority-related call. In processing the assigned authority claim all the necessary information about the concerned body repair shop, the vehicle and the kind of maintenance operations in need of authorization were transferred verbally directly from the network agent to the Maintenance Office's operator who, in turn, took steps to manually record them electronically in the IDRA system. Originally designed to work as a billing system, IDRA had been gradually modified in some of its software components as well as in its communication infrastructure with the aim to be locally adapted in supporting maintenance authority routines. More specifically, each operator could access the

system through entering his ID number and subsequently record his call activity. Indeed, HDA supported staff members throughout the overall authority processing activity, serving the need of electronically registering the verbally transferred information inherent in a specific authorization request (the assistance point, the contracted vehicle in need of maintenance, already driven kilometres, spare parts and labour prices, specific maintenance performances waiting for authorization, etc.). After processing all needed information, the worker relied on IDRA to automatically generated an authorization number that was verbally communicated to the network agent and subsequently used to identify, retrieve, re-work and finally invoice the concerned dossier. Additionally, the system supported and simplified human work with regard to both formal and technical checks through some automatisms (i.e. detail fulfilment, automatic computations) and an instant alert system, providing suggestions and additional details about a specific dossier/vehicle/contract. Next to a call recording functioning, IDRA supported staff decision-making activity through providing real-time access to case information and research databases storing information about suppliers and related contracts (e.g. price and discount conditions, expiry contract date), clients (e.g. lists of contracted vehicles, typologies of maintenance services covered by contract, penalty clauses) and more importantly the history of all submitted authorization requests (e.g. submission date, submitting supplier, results of single evaluations, authorized amounts). Indeed, all the stored data constituted a valuable source of collective codified knowledge that was continuously updated with fresh information about last authority requests and that could be accessed and consulted as needed. Workers could rely on stored knowledge about technical and legal details of contracts (both with suppliers and customers) also for accomplishing the stage of formal checks in the process. However, in assessing forfeit amounts of authorization they preferred to exploit their tacit knowledge at least for time and costs of labour and spare parts, so as to speed up the process and ensuring lower lead times for end customers. Overall, the operator's capability to read and interpret in an integrate manner all the stored information to take decisions about authorization requests was viewed as a key competence in carrying out authority work. Next to supporting technical work, IDRA was also used in accomplishing administrative-accounting tasks, also carried on by specialists in the Maintenance Office. Indeed, they were partially assigned to the invoice processing, having to verify their formal correctness, ending the authorization process and

registering invoices electronically in IDRA before transferring them to the Accounting Department. Software characteristics was flexible enough to enable the so-called "open authority" procedure: the authority team's specialist sets only a forfeit amount of money due to the supplier (i.e. the repair shop) for their maintenance services whereas the precise authorized amounts were only established after receiving a paper invoice from the supplier, containing all the information needed to verifying applied prices for spare parts and labour inherent in each repair performance. In this stage the worker was free to modify the previously approximate values inserted in the system with the new definitively authorized amounts.

Finally, HDA was also a valuable data source for managers since all information data used to elaborate reports and carry on performance analysis for both the authority process (mainly in terms of overall costs) and employees in the Maintenance Office (mainly in terms of overall productivity) were exclusively extracted from such a system. Indeed, data mining was not a simple process at all, since its database architecture was very old and hard-working to manage and it did not enable to track all process steps during its execution. As a result, available final performance data were very approximate and did not provide accurate values for individually and process-related performance measures.

The modified structural conditioning stage

The first significant changes in the conditioning structures embodied in the concerned artefact system were triggered by a rapid market growth process witnessed by the firm. Indeed, the strategic decision to enter the Public Administration led to new customer preferences and needs, an enlarged maintenance assistance network next to both increased production volumes and variety. In this respect, for new users (i.e. employees in the law enforcement agency and security force) the vehicle constituted an essential good for their daily activities, since a high mobility was constantly required by their work. This did mean that both ordinary and corrective maintenance services become, in absolute terms, highly frequent for this user segment and, consequently, relatively much higher than for traditional ones. The wear that derived from using cars in extreme conditions, such as for chase, was a case in point. The massive reliance on the car by new users led to a significant increase in service maintenance needs that was only partially predictable by the firm. Indeed, although it was expected that a higher frequency of use would inevitably

correspond to more repair performances as a result of excessive structural and mechanical strain, it was difficult to anticipate a few systematic and onerous breakdowns in some vehicles as well as the abnormal zeal that the new users showed in keeping the car at the top of its performance. In the Maintenance Office, the unexpected rise registered in the individual overall workload was not seen as a consequence of the planned market innovation; indeed it was mainly due to the over-average number of authorization requests submitted for new users' maintenance needs by new contracted distributors.

The result of new contract clauses with end users was a high level of personalization and modularization of maintenance services led to flexible package solutions and resulted in a large number of technical and legal details as well as contract options. The number of specific typologies of maintenance performance included in the formula, the minimum number of kilometres to be driven enabling an authorization request, the change to apply penalties for car stops beyond an agreed time were highly variable not only for fleets belonging to different group of customers, but also for different groups of vehicles related to the same customer. This variety led to an increase in the average complexity in the content of the authorization estimates submitted by repair shops as well as to a noticeable increase in the average amounts of each submitted request.

Further difficulties also arose from the nature of service relationships between new repair shops and end users as well as by norms of behaviour and protocols of knowledge exchange between new repair shops and the firm. Indeed, repair shops interests tended not to be aligned with those of the service provider (i.e. submitting maintenance authorization requests only when actually needed along with applying appropriate prices for each repair performance). Conversely, widespread attitudes were opportunism, self-interest and speculation, since sometimes they tended to submit authorization requests also when the functioning state of the vehicle was actually satisfactory and the delivery of maintenance services superfluous. Differently from what happened in the old network arrangement, inter-personal work interactions during authority tasks did not occur with an identified service provider, between a narrow number of repair shops' owners and well-known authority staff's members, but they were viewed by both exchange parties as anonymous service encounters (Gutek, 1995; Schultze & Orlikowki, 2004), regulated by written contracts.

The increased volume and variety in the authority maintenance requests along with new users and network agents' preferences and behaviours revealed the inadequacy of adopted procedures and their related technical artefact system to the management. Accordingly, some top-down actions were instantiated through deliberate changes in the physical structures embodied in technology (and in embedded organizational routines) but also in high-level ones (sometimes unconsciously). Specifically, a new technical component was added to the incumbent artefact system. Fax was an established technology with a very simple technical function: it was introduced with the aim to enable indirect information exchange between network agents and the authority team specialists as well as the subsequent paper-based processing of authorization requests. It resembled a "tool" view of technology (Iacono & Orlikowski, 2001) since its technical simplicity did not require mindful efforts for potential users to "read it" (Hutchby, 2001) and understand its functioning from both authority specialists and network agents. In this respect, the actual adoption of fax technology was only possible if also network assistance shops accepted to use it to submit their authority requests and, accordingly, they also had to understand how to correctly use it. As for physical structures inscribed in the new artefact, a centralized fax was installed internally to the Maintenance Office to receive all written requests submitted by network agents, whereas each authority team specialist was endowed with a personal fax for sending back the processed estimate to the assistance operator with an authorization number as well as any corrections and adjustments made in the submitted quotes.

It is worth highlighting that the main procedural rules were not inscribed in the materiality of technology but mainly in other non-technological artefacts. Among these, the most important, automatically associated to fax use, consisted of the written estimate, that the network agent had to fill in with a list of established information (substantially the same that were previously verbally communicated by phone), submit to the firm and wait for receiving it back, signed and completed with authorized amounts and an electronically-generated authorization number. By relying on the specific information reported in the written authorization request, each operator had still to register them in the IDRA system as well as rely on it for an automatically generated authorization number. However, he had to carry on all formal and technical checks and computations upstream and establish accurately the overall amounts before releasing the authorization. Internally the Maintenance

Office, a senior technician was assigned the formal role of randomly and manually distributing all written requests centrally received by fax to all authority operators, by ensuring an equal distribution of overall daily workload. This new operative procedure corresponded to what was called "closed authorization" and replace the previously adopted "open authorization". Indeed, the novel technology inscribed new protocols of information exchange and rules of behaviour also for shop repairs, beyond the purchase and adoption of the same technological innovation (the fax). For more onerous and complex repair performances, both old and new suppliers would be constrained to precisely fill a written estimate with a number of information that they were used to transfer verbally and send it to the Maintenance Office by fax along with subsequently using the same artefact to receive an answer. Moreover, in order to appropriately channel authorization submissions, an economic criterion was introduced for shop repairs. More specifically, since on average the complexity of the maintenance service package grow steadily with inherent authority costs, an economic threshold value was established to separate requests to submit by phone or, alternatively, by fax. Accordingly, each worker in the Maintenance Office was simultaneously charged to process authorization requests submitted by both tools.

As for second-order structures, the adoption of a written estimate and of fax technology inscribed the intentions and expectations of top management with regard to the performance outcomes of authority routines. On the one hand, the market growth led to a noticeable increase in the complexity and variety of technical and legal details and options for the contracts. For specialists, the new operational context made it difficult to process more complex authority requests by relying on the phone as channel of information exchange. In light of the adverse behavioural attitude of repair shops, authority team had to cope with an abnormal occurrence of maintenance authority requests by augmenting the stage of technical checks, so as to more accurately verify in advance the physical and functioning state of the vehicle and then establish forfeit authorized amounts by phone. Indeed, longer times involved in this kind of knowledge-based activity did not well fit with the use of phone as the exclusive channel for transferring and exchanging information with repair shops. Actually, calls needed to be the shorter as possible not only to ensure rapid delivery times to end users, but also to avoid repair shops' displeasure with be kept on phone for a too long time, while the authority team's member was carrying out all checks.

Further difficulties arose when the authority process entered in the subsequent stages, i.e. when actual amounts to authorize had to be adjusted on the basis of more accurate formal checks and data entry in the IDRA system had to be made. To the authority team, it became harder and more time-consuming to carrying out formal authority checks, since they could not simply rely on their practical experience and tacit knowledge to evaluate times or prices of labour and spare parts as well as applied discount rates, since these was largely variable according to the specific supplier's contractual conditions. In this phase, it was not rare to find that significant differences between previously forfeit and definitive amounts constrained workers to re-work authorizations to a large extent, modify many values electronically inserted as well as inform the supplier about brought rectification. Furthermore, the longer times spent for accomplishing formal check authority work, together with traditional administrative-accounting duties, induced workers in the Maintenance Office to witness a significant worsening in the level of attention focus on technical issues. Managers (as well as specialists) believed that through shifting to fax technology and a written estimate they would better face complexity and variety of new service offerings, ensure more accurate estimates and avoid network agents waiting on the phone for long time before the release of the expected authorization. In a nutshell, both operational efficiency and service level would have improved significantly. Finally, technological innovation also inscribed another second-order structure, i.e. that related to roles and relationships. Indeed, the adoption of fax led to assign more authority and control to the senior specialist who was chosen to collect all submitted estimates and distribute them equally to all specialists within the Maintenance Office as well as to control the daily workload and provide support to other specialists.

The social interaction and the emerging technology and routines in practice

The implementation of the described structural changes developed through an experimental stage, during which the adoption of the fax was initially tested with a limited number of trusted repair shops, primarily because they were considered more open–minded than the new network's members and then more culturally oriented towards technological innovation. Similarly, within the Maintenance office, only some specialists were assigned to the management of written estimates. The experimental phase lasted all the year 2008 and during it there was a process of adjustment and resolution of the main problems generated by the new operational

context. More specifically, by relying on a written estimate for more complex maintenance services, the authority staff's members immediately experienced better work conditions, since time-pressure to carry on all formal and technical checks was reduced as well as the error rate in calculating definitive authorized amounts. The new operational conditions required more cognitive effort to authority specialists. Specifically, the need to focus, monitor and manage contracts costs and margins in order to hold down overall authority costs as well as face toward potential opportunistic behaviour from suppliers became a priority whereas managing complex customer operational procedures and contract prescriptions, recognizing and appropriately managing authorization requests for special vehicles, ensuring the fulfilment of very strict service requirements for fleets required the accurate knowledge of procedures and documentation as well as a general contract overview. These operational context was difficult to conciliate with administrative and accounting duties that also were required to the Maintenance Office's workers. Indeed, they were also partially assigned to the invoice processing, having to verify their formal correctness, ending the authorization process and registering invoices electronically before transferring them to the Accounting Department. This practice did not create any trouble with the verbal authority and did not significantly affect service lead times since the repair shops could immediately proceed to repair the vehicle just after the release of a forfeit authorization. However, with the shift to fax technology, the need to attach more time and focus attention on technical matters was difficult to conciliate with accounting tasks. For this reason, the adoption stage was marked by the allocation of all the invoice processing routine to another organizational unit. However, a number of unexpected changes also emerge during work practice and daily interactions as a result of the adoption of new technology, along with more complex operative rules and procedures as well as information and knowledge management protocols. First of all, using fax contributed to creating some bottlenecks in the regular flow of the authority process. A low cultural and educational level of most shop repairs, jointed with a low familiarity with technological artefacts and word processor tools, could lead to submit incomplete, crabbed or sketchy written estimate. Workers in the authority team adjusted to such events and solved the trouble by shifting to the phone channel and directly calling shop repairs. However, such a practice contributed to lengthen overall service delivery time, also because requests submitted by fax were not immediately assigned

and processed as it happened for those made by phone. Difficulties also arose from the simultaneous allocation of each worker to both verbal (i.e. by phone) and written (i.e. by fax) tasks. Indeed, the overall increased complexity in accomplishing the authority task (because of new formal checks along with more difficult technical evaluations and problem-solving tasks) made it difficult for an operator to interrupt her ongoing offline work to assign and process a call. The rise of lead times between the submission and allocation of written authorization requests sets the stage for an increasing number of reminders both from shop repairs and end users in the form of calls and e-mail to the Call Center and the Maintenance Office. When reminders caused repeated pressure or concerned special vehicles (whose a longer car stop caused penalty payments), retrieval of specific solicited requests was particularly hard among a pile of many estimates and additional documents. All such work conditions led to re-working, lower power of concentration and increased psychological tension, beyond physical bulk and higher paper costs. All tensions and problems deriving from backlog workload triggered a vicious circle, leading to longer repair times for vehicles and dissatisfaction with end users and customers, in turn, causing more reminders and solicited requests. Moreover, for workers in the Maintenance Office the reduced verbal interaction with repair shops made it more difficult to manage relationships and exacerbate tensions and attitude towards cooperation and trust-building. Within the Maintenance Office, the massive reduction of verbal authority tasks resulted in lower chances of learning by listening whereas the increased time pressure left little space to knowledge sharing and mutual help; on the contrary workers tended to carry on authority tasks autonomously, facing problems through contingent solutions rather than identifying precise causes so acting directly on them.

The self-reinforcing dynamics: path-breaking vs path-dependence

The addition of fax technology to incumbent tools (i.e. the phone and IDRA) can be viewed as a disruptive event that modified the incumbent structuring conditions and, accordingly, the subsequent social interaction stage. Through relying exclusively on the phone to handle submitted requests, authority team's members were used to rapidly close a request. In order to ensure short delivery times they exploited their memory and tacit knowledge with regard contractual conditions and manually calculate forfeit amounts, delaying the more mindful effort to the subsequent invoice

processing stage. Furthermore, the direct and verbal nature of information transfer with a reduced number of network agents had contributed to strengthen mutual confidence and trust and fostered short processing lead times. Within the office, paper circulation was highly limited whereas almost all the authority process was under the control of maintenance office's employees.

The introduction of the fax tool did not require in itself new significant learning efforts since it was a very easy-to-use artifact neither the old acquired knowledge in using the IDRA system risked to become obsolete. Indeed, the new work procedures inscribed in a non-technical artifact, i.e. the written estimate, had the most path-breaking force for workers since it substantially changed their traditional working routines. Actually, they were constrained to process more complex authority requests with mindful effort from the beginning, through accurately making all formal checks, technical evaluations and needed calculations. Furthermore, they had to exploit the knowledge codified in the IDRA system with regard to specific contractual clauses and inherent conditions in order to manage high variety and personalized contracts. Workers perceived both affordances and constraints of the new technology in relation to their goals. Indeed, through relying on a offline processing, they could accurately make all checks and evaluations with less time pressure and risk of mistake. However, a number of constraints led users to change organizational routines (Leonardi, 2011) and , in so doing, they partially modified underlying structures carried on by the new technology system. More specifically, when the estimates submitted by fax contained mistakes or missing information, workers workaround the problem though shifting to the phone and to the verbal authority. The creation of the X disc can be interpreted as an adaptive and creative solution to problems arisen with consulting contractual information in the IDRA system. At the same time, since processing written estimates in advance and simultaneously handling both requests submitted by phone and by fax excessively increased workload, new labor division criteria were introduced fostering more specialization and competence development for authority team's members. In this respect, it is worth highlighting that the need to manage increased variety and volume would subsequently have led the top management to split the Maintenance Unit in two offices and corresponding group of specialists. Specifically, a I-technical level would have functioned as a front-office structure, handling customer requests and less complex authority requests (i.e. those under the threshold established value), where

as a II-technical level would had included specialists with high technical know-how and practice expertise and would had handled more complex authority requests. Such a division also corresponded to a different use of technical artefacts: the I-technical level would exclusively have handled authority requests submitted by phone, whereas the II-technical level group would have processed written estimates submitted by fax.

Differently from learning effects, the addition of a new technological tool did not significantly break down existing coordination mechanisms. Indeed, handling an authority request substantially remained an individual task for each authority specialist, although the assignment was now made by the senior technician. However, new coordination needs made them visible in particular situations. Specifically, coordination among authority specialists was required in case of reminders, when each workers had to check if the solicited request had been assigned to himself, whereas Accounting Unit's workers had to coordinate with authority specialists when received invoices showed anomalies, i.e. significant mismatches between authorized and billed amounts. Actually in these cases, the Maintenance Office's members had to process again authority requests in order to solve anomalies.

Complementarity effects can be evaluated in terms of synergies offered by fax technology when integrated with incumbent technical artifacts, i.e. phone and the IDRA system. Fax was viewed by top management as the cheapest and effective solution at hand to enable the shift from a direct and verbal to an indirect and written-based authority. As we have already said, also workers in the Maintenance Office recognized the value added by the new tool to authority routines in light of the witnessed changes in the relational context and market environment. Indeed, they shared the management view regarding the need to carry on all evaluations, checks and computations in advance i.e. before releasing the authorization in order to hold down overall authority costs, although they knew that this would cause increasing delivery lead times. This can help to explain their attitude to experiment and adapt mainly their work routines. However, during the social interaction stage, workers also realized that although being a complementary necessity, fax created trouble and time-pressure conditions to workers since it had to be used together with the phone to handle all kinds of authority requests.

Adaptive expectations effects resulted highly interrelated with previously described mechanisms. Previous beliefs and expectations about process performances and related technologies and routines were rapidly abandoned by authority specialists after the market innovation and the consequent enlargement of the assistance network. Indeed, the progressive erosion of providers' trustworthiness together with the increasing complexity and variety of contracts made it clear that they would drop old work procedures and that the expected control of overall costs and careful evaluation of each single request could be obtained only through dismissing the high exploitation of tacit knowledge and the direct communication with providers, renouncing to handle also the invoice processing stage and accepting increasing lead times, paper circulation and cognitive effort. This does mean that the technological shift from phone to fax marked the breaking down of old expectations and new ones rapidly adapt to the new market environment.

4.4.2. The transition from fax technology to a new ticketing system

The second relevant deliberate change in the technological artefact system started in March 2009 with the rapid and not pre-announced introduction of a new ticketing system within the Maintenance Office. Similarly to fax technology, the new technological component was added to pre-existing ones so that it required that authority specialists used it together with phone, fax and the IDRA system.

The modified structural conditioning stage

Help Desk Advanced (HDA) was a help desk software already used within the firm. Specifically, it served the function to monitor every single request submitted by clients to the Contact Centre Unit through generating an electronic ticket and associating an univocal code to it. Tickets could be closed immediately by a first technical level or, in case of more complex problems, transferred to a second technical level, directly dispatching the ticket to the technical group/office endowed with the more appropriate competences. However, its use was extended only to some organizational units, and the Maintenance Office was not among them. Indeed, available licenses were limited in number. HDA had many functionalities and features. Among this the most important and actually used was that of tracking tickets associated to service requests. Data and information were stored in a single inbox, tickets could be integrated with new details and all information were always

available and rapidly searchable through an identification number (ID) univocally associated to each ticket. HDA also supported a number of mail functions, like the ticketing forwarding other functional areas/individuals, the automated sending of information to users of the service, the viewing of partial and final solutions by all users. Finally, a specific module enabled the creation of customer report statistics about response and resolution times, open and closed tickets, service delivery performance sensitivity. Despite many help desk functionalities, when thought to be used within the Maintenance Office to process authority requests, data and process certification was the main functionality emboding top management intentions and goals. Furthermore, through relying on HDA, authority specialists could process submitted requests in an electronic format, so contributing to the "paperless" goal established by management in the attempt to reduce authority costs as well as the increasing volume of paper documents, making it easier the operations of storing, retrieving and consulting authority-related data. Although not originally designed to carry on authority tasks, HDA was viewed by top management as a quite cheap solution, since its adoption only require to buy more licenses so that it could be installed on all authority specialists' personal computers. Indeed, technological investments to be made had to be selected accurately, since the firm was witnessing a significant and rapid process of growth that clearly required a number of investments in new resources and physical infrastructures. It is worth highlighting that although the senior technician has showed his scepticism with regard to the new system and specifically about its capacity to store a massive amount of authority data without crashing to management decide to implement it the same. Accordingly, relying exclusively on internal IT human resources and the active involvement of the senior technician, the available system was analyzed so as to understand how its flexible components could be adapted to carry on authority requests.

After the development stage, a number of procedures were inscribed in the artefact for both suppliers (the network agents) and authority team's members. It is worth highlighting that the involvement of a senior technician in the development of HDA influenced how specific functions were inscribed in the artefact as well as how it was subsequently framed to specialists. As for the first, fax and e-mail could be equally used to submit a written authorization requests whereas e-mail was the main channel to communicate information or transfer all relevant documents (e.g. photos, certifications, supplementary data) to the Maintenance Office. Three different e-mail

addresses were expressly created to manage inbound flows according to their nature. More specifically, two of them had to be use for submitting estimates, whereas a third address was assigned to other technical questions, supplementary documents and further information exchange. All submitted fax and e-mail were automatically transformed in tickets that were visible to all operators in the IDRA inbox. Indeed, tickets could also be those transferred by the Call Centre when they represented II level requests. As for HDA use within the Maintenance Office, the manual dispatching of requests would have replaced by self-assignment: each operator had to charge himself with a ticket within the inbox according to a FIFO logic that was established by management to ensure the random allocation of requests among specialists. In order to trace each authority ticket it was necessary that HDA was used, instead of personal e-mails, for communication and information exchange related to specific authorization requests with both other internal and external actors (e.g. network agents).

The social interaction stage and the emerging technology and routines in practice
The development stage was very short and ended up with the installation of IDRA on all specialists' personal computers within the Maintenance Office whereas the senior technician was assigned the role of guiding other specialists in using it. Actually, these did not have the freedom to choose of not adopting HDA since it worked as a workflow management tool supporting daily authority routines. Feelings of fear and anxiety were initially spread among some members, since they were aware that the adoption of the new technological artefact would make the authority process more visible and traceable and would enable higher accountability and more accurate performance measurement. However, the new emotional state did not impede them to use it and gradually be relieved from any fears. Highly relying on the guiding role of the senior technician, authority specialists could feel comfortable in using it. The absence of any strong influence and constraining framing activity expressly realized by top management positively affected their propensity for learning by doing as well as spending time in exploring and experimenting with it. Indeed, this let them to perceive an unexpected number of functional affordances. Next to the basic and more intuitive functions of ticket inbox, ticketing tracking, information sharing and data transferring both internally and with other offices as well as with external actors (suppliers and clients), it revealed itself as a powerful tool to easily search, retrieve

and look through the history track of a given authority request, whenever it was necessary. Experimenting with the system on a daily basis specialists learnt how to retrieve a specific authority request and all related documents alternatively searching through the ID, the numberplate or the authorization number. The electronic transfer and storing of information brought a number of immediate advantages in comparison to the old paper-based processing since the risk of losing or do not finding documents as well as overall processing lead times were significantly reduced. The discovery of a new functionality enabled the senior technician to assign a different priority level to authority requests and make them visible to all operators through relying on a colour-based system. In this way it was possible to take into account client claims, special requests (e.g. those implying the payment of penalties) etc. Authority team's members also discovered how HDA enabled to anchor specific documents received in different times to the related authorization request through its identification number. In this way all information could be centralized and easier analyzed in a systemic way.

The introduction of HDA also led to some emergent changes in authority routines. Indeed, submitted requests through the e-mail channel were not exclusively constituted by authority estimates or technical information related to submitted requests. Next to advertising contents, the percentage of tickets with another destination office noticeable increased as well as the subsequent need for authority specialist to send them to the related office. Communication within the Office and among external ones increased and the variety of discovered functionalities fostered more structure for the process and the need to manage a variety of new events (e.g. attaching a document to a specific ticket, receiving not-authority related requests, assigning a priority level).

HDA was perceived as a flexible tool by specialists and since it was not actually used to performance measurement they gradually feel increasingly comfortable in using it. Although they have to adopt a FIFO logic in choosing a specific requests, they could actually do not adopt it or alternatively could self-assign it and then re-put it in the IDRA inbox with no consequences. Similarly, although HDA could be used to manage (and accordingly track) information flows between team's members and network agents, personal e-mail were also highly used often to reduce lead times and ensure that the same operator opened and closed a specific requests. Since a constraining procedure did not exist, the systematic storing of e-mail documentations

(mainly photos) in the X-disc - purposefully created to keep all authority-related documentation - did not always happen.

The self-reinforcing dynamics: path-breaking vs path-dependence

The introduction of HDA created a "window of opportunity" (Tyre & Orlikowski, 1994) for authority team's members in terms of exploration and experimentation of its material features and functionalities. HDA did not replace incumbent technical artefacts; on the contrary, it was added as a new component to the pre-existing technology system and authority workers had still to simultaneously rely on the phone, the fax and the IDRA system to carry on their daily tasks. As for the phone, it was still mainly used to process ordinary maintenance authority requests that did not require any complex technical evaluation, whereas workers could more rely on the communication capabilities of the new technical artefact to electronically (and then indirectly) manage partial inbound/outbound information flows that were previously processed by phone. As for fax technology, the main inscribed rules i.e. those associated to the written estimate, were also not dismissed with HDA. Indeed, network agents continue to use it, next to e-mail, to submit authority requests, whereas authority workers, although processing an electronic estimate, still continue to adopt older rules and routines for the formal and technical evaluation of authority requests. Acquired knowledge in using IDRA was not at risk of obsolescence, since it was still used to register authority requests and release the authorization number. HDA was not integrated with IDRA and this did mean that workers had now to simultaneously manage both systems. However, this did not create any trouble. Rather, they learnt to exploit provided spaces in the IDRA interface to insert tickets numbers so as to make it easier to recover information about still open requests needing further documentation/information in order to be closed. These new learning opportunities did not questioned acquired collective knowledge. They have the freedom to bypass it sending directly e-mail from their personal addresses, but this was made to shorten delivery time, although often documentations was not linked to the related ticket.

HDA revealed itself as a powerful tool to improve coordination both within the Maintenance Office and with other offices' members. In this respect, rather than creating new coordination needs or disrupting old mechanisms it helped authority team's members to make incumbent rules more efficient through relying on

electronic communication and information exchange. Indeed, instead of constraining the use of personal e-mails, HDA enabled direct and centralized exchange flows and the sharing of information related to specific authority tickets to that they could be visible to all interested parts, both internally and externally the Maintenance Office. In this respect, claims management is certainly a case in point. Indeed, before the introduction of HDA, whenever repetitive reminders were brought to the senior technician or a specialist's attention, the concerned request had to be manually searched among a pile of paper estimates and related documents all received by fax. This required coordination among the senior technician and all specialists so that the reminded request could be processed as soon as possible. Since both formal checks and technical evaluations have become more complex and time-consuming as a consequence of market growth, the average number of authority reminders submitted by network assistance agents increased. In this respect, HDA enabled an easier and faster retrieval of the reminded request in the inbox and made coordination more immediate through relying on HDA capabilities to change the priority level assigned to a given ticket. Furthermore, through electronic self-assignment, the senior technician was also relieved of the dispatching task.

HDA offered authority processes a number of functionalities that significantly improved communication, information exchange and coordination. It was early viewed as a complementary component to the incumbent technological system and process-supporting tools and this help to understand why it was rapidly accepted by authority specialists as well as to explain their propensity to explore and learn its functionalities in order to improve the quality of their daily work.

HDA was chosen by top management because new expectations with regard to the authority process were arisen as a consequence of the rapid market growth. On the other hand, authority specialist ended to recognize that new operative conditions required the organizational restructuring of their daily work. Accordingly the introduction of HDA was witnessed by them as a "necessary" technological change. These expectations gradually reinforced since HDA revealed itself as a tool able to improve operational efficiency as well as reduce delivery times.

4.4.3. The technological transition from IDRA to SID

In January 2010, exactly nine months after HDA implementation, a new technological change was introduced in the Maintenance Office. Actually, differently

from previous innovations, the introduction of a new technological system (SID) was not simply a response to "local" needs of the authority processes but part of a larger innovation project started in 2005 that involved all business units and intend to be extended to a large number of organizational areas, including the Maintenance Office. Indeed, the design, development and implementation of an integrated ICT system at firm level was the major concern of top management. Such an innovation represented the firm's technological response to market growth strategic goals pursued through new business development, acquisitions and international expansion. The new system would have supported the shift from artisanal to large-based industrial production through ensuring its usability in different environments (e.g. operating systems, application servers or database management systems) and its potential evolution towards a software architecture able to support the integration with the chosen Enterprise Resource Planning (ERP) along with business partners' information systems.

The modified conditioning stage

The new information system was based on a proprietary technological solution (Adobe Flex) not still tested on a large scale. Co-developed with an external IT provider, it included a number of interactive modules so as to meet the functional needs of different organizational divisions. As for the maintenance services business, a specific module, designed to be used in the Maintenance Office, enabled to control and authorize specific operations at workshops. Both top management and the IT divisions were highly confident in the new technology. According to the Operative Director, it represented the best compromise in terms of accessibility, maintenance and efficacy of the graphical user interface and he expected to achieve benefits for both the business and end customers. On the other hand, the IT division appreciated the advantages of a web architecture (i.e. a centralized installation and an immediate usability of later software releases) and of desktop applications (e.g. a user-friendly interface and powerful functionalities). With specific regard to maintenance services operations, it enabled to visualize on a single screen and in different panels, all information regarding the concerned vehicle, contract and assistance centre. Furthermore, through a dashboard software the worker was enabled to access all the details regarding a specific vehicle, such as planned maintenance performances, the historical documentation of previous operations, already made tear-off coupons, the

state of each tyre tread, all related notifications and attachments. The user interface strictly imposed the workflow actions to execute and the information data to fill in order to complete the electronic registration of an authorization request. It served the function to simplify human work through: automating the fulfilment of some details and computations of partial and overall amounts; providing an instant and automatic message system with further information about suggested steps, controls, notifications, alerts; visualizing the state of a specific request (authorized, in progress, rejected) and identifying - for any "in progress" request (typically waiting for further documentation before closing) which operator had previously processed it; enabling the direct communication and information exchange with other offices (e.g. Contract office, Accounting Unit, etc.) and network agents; releasing a serial authorization number for each approved request; providing specific spaces to freely write messages to send to providers (called "supplier notes") as well as the kind of requested performance and related processing state (called "operation description").

The social interaction stage and the emerging technology and routines in practice

Differently from previously described technological shifts, the new information system replaced the incumbent IDRA, viewed by top management as an obsolete home-grown system not more suitable to authority process management and the increased service production volume and variety. The implementation phase started in the "II-technical level" office where four technicians were involved in testing the technical functionalities of the new system, signalling its bugs and suggesting potential changes and refinements to the IT team, practising with new software releases, and training other authority technicians about the system use.

The process of framing the new system to future users did not rely on written procedures or technical manuals, but was exclusively based on the training activity made by early adopters in the Maintenance Office, under the supervision of the senior technician. In general terms, the workers were well aware that IDRA system was technologically obsolete and that its replacement was inevitable ("a necessity") given the new business context. More specifically, despite a number of refinements and software modifications, IDRA was not suitable to store the increasing amount of data related to new contracts, suppliers and customers and the overall number of system crashes was notably increased creating trouble for daily work. Accordingly, they showed a marked willingness to adopt the new system and learn how to use it.

In this respect, it is worth noting that it also contributed to their positive attitude the feelings of great respect and esteem they felt towards their Operative director and his decisions. Actually, he ended to be highly involved in daily matters about authority processes after that the unexpected dismissal of the Maintenance Office Chief had constrained him to hold that post temporary. In practical terms, the technical features and in particular the graphical interface made very easy to understand SID functioning and familiarize with it. This was particularly true through comparing SID to the old IDRA system, whose physical features did not enable an easy understanding but, conversely, had required much cognitive effort and time to get acquainted with it and the problem presented again for new employees, especially for those belonging to the "I-technical level" office. Substantially, SID would have not radically changed the old authority routines, that still consisted of two main stages, i.e. formal checks and technical evaluations. However, its use would have simplify the overall electronic registration of each authority request, through automatic filling of certain data along with computations, a more frequent and precise message system, an easier access to contracts, vehicle information, etc., direct communication with suppliers and other offices. Additionally and more importantly, it would have reduced worker's freedom to proceed and finally release an authorization number also when it was not allowed by contractual details. Indeed, the system had the capability to process input information and verify contractual conditions. In some cases, an alert message was visualized on the screen to invite workers to be careful about specific details and further step to do, whereas, in other cases, the system completely impede him to proceed. In this sense, the new system was more constraining that IDRA through which the operator could always release an authorization, also risking to be wrong or that sufficiently accurate evaluations had not be made. Actually, some system constrains did create some trouble to workers and did not produce the expected performance outcomes. Indeed, through a given interface, the specific SID module designed for processing maintenance services could access to all relevant information about contracts stored in the central system database, that constituted the "core" part of the system and automatically made the needed controls. However, the relational database structure revealed itself as not suitable to manage the complex structure of a large and variable amount of quantitative and qualitative data concerning contractual details. As a consequence, when the system only alerted the operator through visualizing specific messages the

provided information still were quite generic and the worker spent time to consult contractual procedures regarding the specific vehicle in question and established how to proceed. In these cases the retrieval of useful information stored in the system was not more efficient than with the old IDRA system, since registered information were not exhaustive and easy to access. The situation was also worse when the system impeded to authorize the request. In fact, through consulting contractual details in the X disc, workers often realized that the system was often wrong in its automatic evaluations. In these cases, they were constrained to further work, since they had to check any fail of the system and signal it to the IT group whenever it presented during daily work.

The new system was framed by top management and the IT specialists as a more powerful tool to easily produce more accurate statistical reports about authority processes and individual performances. In this respect, data mining became faster and customizable according to specific needs of management in terms of performance analysis. However, no efforts was made to automatically capture and register crucial lead times or also to take into account that more operators could process the same authority request in different temporal times. In this respect, the system did not enable to precisely impute workload to each worker and in producing reports, authorization were charged, for simplicity, to the first operator who had self-assigned the request. Actually, the new system would enable to register overall imports requests by network agents so as to automatically compute the "cost saving" as an efficiency performance indicator. However, since its electronic insertion was manually made by the specific operator no guarantee about its trustworthiness was possible.

The self-reinforcing dynamics: path-breaking vs. path-dependence

In terms of learning, SID did not revealed itself as a disruptive tool, able to breaking the incumbent routine path. In fact, as we have discussed, all main functionality offered to workers for their daily authority operations simply reproduced, although enhanced, those already enabled by IDRA through its material features. Learning did not meet resistance because its user-friendly interface enabled an easy shift from the traditional one, without loosing the essential procedural knowledge that they had acquired through using IDRA. Actually, they tended to reinforce old routine patterns, since a number of potential improvement areas already identified during IDRA use

remained unsatisfied with SID implementation. However, compared to IDRA, the higher constraining power of SID impede workers to explore through looking for workarounds in order to have the authority request processed. Indeed, IDRA flexibility and higher affordance, in case of system failure, enabled workers to complete a request, so avoiding malfunctions, delays and then customer dissatisfaction. Also with the new system workers could not completely dismiss the use of X disc, since it was viewed as the only reliable source of information and data about contractual details, providers, partners and customers. Since SID was a more active agent in processing authority, this did not give room for cognitive effort and disincentive human reflexivity.

When SID was introduced in the Maintenance Office, the most significant organizational changes have already been implemented so that workers have previously experienced modifications in coordination and knowledge transfer routines. In this respect, the strategic decision to create a double technical level structure for the Maintenance Office was implemented starting from October 2009, exactly three months before the introduction of SID. Such a division had implied a number of organizational consequences and created new coordination requirements among specialist belonging to the two technical levels, since they were physically located in different geographical areas in the country. Similarly to what happened in the II-technical level Maintenance Office, also in the I-technical level one the introduction of SID was made through the coordination and guiding role of the elected office manager. This technical group, located in Rome, gradually grew in number and initially made up of two young workers, in June 2011 it included six people. Relying on a training period in the II-technical level (in Milan) the first level workers have learnt to use both HDA and IDRA and to coordinate their work with that made by II level technicians. Coordination needs primary concerned providers or customers reminders that were processes by I level technician by phones but also technical requests that, although a low overall amount, were technically more complex and consequently required more competences and technical expertise. Actually, in these cases, workers invited providers to submit a written request. Indeed, HDA was mainly use to process documentation and information regarding the maintenance authority requests submitted by tyre-dealers as well as all general requests both identifiable through specified e-mail address. However, it became routine that, in order to balance workload among the two offices and avoid too

delays, workers in the first level also processed requests submitted by fax/e-mail through accessing them in the HDA inbox and evaluating their level of complexity. When receiving reminders, I-technical level workers were used to enter HDA, search the solicited request in the inbox and change the priority level to that the changed colour worked for II-technical level workers as a reminder to process the critical requests as soon as possible. Coordination among the two offices was mainly made by phone among the two respective office managers according to contingency need and workload in the II technical level office.

SID left substantially unchanged coordination rules neither contribute to make it more effective to a significant extent. Indeed, similarly to IDRA, SID enabled to write notes in given spaces and since they were visible to subsequent operators actually acted as an essential coordination mechanism. However, it did not enabled to keep track of the overall sequence of actions made and communication messages sent to network agents. In few words, SID fostered the reinforcing of already existing coordination patterns.

SID was clearly a complementary tool to authority request processing. Since it replaced an incumbent system (IDRA) its complementarity has to be evaluated in terms of the higher synergic gain that workers witnessed in using it when comparing pre-existing complementarities among IDRA and other authority-related technological artefacts. Actually, SID produced a number of benefits compared to IDRA that led to savings in terms of average processing times and at the same time enabled more accurate performance evaluations for top management. Furthermore, it was recognized that for future employers SID would be easier to understand and more immediate to use. However, workers also recognized that the new system has remained unsolved some of the main problems and technical limits implied in the materiality of IDRA and with specific regard to data accessibility and retrieval the constraining features of SID did even worse the regular workflow in comparison to IDRA. Accordingly, also in terms of complementarity effects, the introduction of SID did not correspond to a "path-breaking" change and interruption of old routine patterns.

In order to understand how users' expectations about the technological system were disturbed by the introduction of SID, we need to consider how incumbent expectations had been entrenched in users' routine behaviour through an extended period based on the old IDRA system. In this respect, although workers ended to feel

comfortable in using IDRA together with other technical artefacts (i.e. phone, fax, and HDA) they gradually realized that the increasing number of crashes was largely due to much higher volume of data to store and manage. They were also aware that starting from 2005 a firm-based information system project had been started and that it would have involved all main departments and offices, including the Maintenance Office. This means that expectations about IDRA were already changing and evaluations routines were projected towards a more sophisticated and powerful information system. Accordingly, before SID implementation in the Maintenance Office, expectations had been partially already broken and this fostered its adoption among users. However, users' expectations were not completely satisfied by the technical functionalities offered by SID and this influenced, together with its high constraining power, users' attitude to experiment with it and explore all its potential. Its use was limited to its basic functionalities, substantially replicating what workers already did with the old IDRA system.

4.4.4. The technological transition from HDA to JOSH

The last relevant technological innovation was introduced in the Maintenance Office starting from June 2010. For both I and II-technical levels, HDA was completely dismissed and a new IT tool (JOSH) was adopted to execute and monitor authority related processes. Conversely, no change was planned for other technical components so that the use of Josh would have been integrated with other incumbent artefacts, i.e. phone, fax and especially the maintenance services module of SID.

The modified conditioning stage

Josh is the commercial name of an integrated enterprise software platform developed by an Italian software house (IT Consulting) in collaboration with some players in the fields of academic research and consulting. The product was mainly conceived as a solution to satisfy the different needs of managing destructured data, such as documents, processes, skills and competences, making it possible an incremental formalization of the company processes and a capitalization, improvement and redistribution of organizational knowledge to interested parts.

The platform architecture was logically made up of two main building blocks:

- josh.doc is a module of advanced document management for the registration and retrieval of explicit knowledge codified in documents and multimedia files. It is

standard, i.e. based on the most commonly used hardware and software environments available in the market (Microsoft technologies). Based on Microsoft SharePoint, those functionalities are enhanced, through a more rapid and effective access and expanded with a number of tools, for increasing productivity and capitalizing on explicit knowledge. The Microsoft SharePoint document management system differs from a traditional file system in fundamental technical functions like versioning, classification, metadata and search. Furthermore, it is highly integrated with Microsoft Office for maximum simplification in terms of access to the document repository. Additional functionalities in josh.doc include in particular the use of a scanner to acquire paper documents, saving and classifying then, with appropriate metadata and barcode in the SharePoint repository and the automated categorization of documents used in the processes.

- josh.flow is a workflow management system for built-in knowledge that enable through an instant-messaging and intranet infrastructure the immediate communication between agents executing the same activities, to correlate the use of documents to the specific executed activities and more specifically to provide information about their specific use. Differently from other workflow systems, Josh's operation is based on a description of company processes. This does mean that, starting from the design of a workflow, and from the various professional figures in the company, it is possible to automatically assign tasks to the various corporate functions, indicating which documents to use and how certain operations are to be carried out. In other words, it not simply contribute to make processes' execution more efficient and automatic but it is flexible and can be adapted also to not structured processes or to processes with few instances. Josh is presented on the market as an easy platform since it does not break the actual work habits but adapts to the company's organization and to its existing work processes, on a case-by-case basis.

Furthermore, the Josh platform include some complementary applications of knowledge management and business process management. Among these, JoshArchive! is a solution based on the same Josh technology for the digital protocol registry and lawful substitutive conservation of documents. It can be integrated with a number of management software (ERP) and centralize the functions of the documental system (Microsoft Office SharePoint Server) and provide workflow services to support the conservation process.

Josh eliminates or reduces the need of IT specialists or programmers, because it has been designed as a business oriented tool and can be graduated as the company grows and as technology is spread throughout the various organizational services. Furthermore, it confers autonomy and reactivity thanks to the possibility of updating business process without programming and changed them according to new needs.

In terms of architecture, JOSH has a client-server structure. Among the client tools, a particular note should be attached to the following components:

- josh client is the web component, usually presented within the SharePoint portal, where the user receives from the system the specific task to execute. The visualization of single tasks offers next to the description of the tasks assigned to the specific user, some contextual suggests about the most frequently used documents for the same task from other workers. Through a clustering functions, documents can be analyzed and classified exploiting text-mining technology and presented according to a hierarchical structure. Furthermore, it can also be used to give a detailed view of the workflow and of its relative state of advancement. The interface can be set up at single-user level;

- josh designer is the tool used to graphically define the company processes and assign tasks that comprise them to the various professional figures, based on a variety of policies. To this end josh exploits the graphical formalism called WIDE (Workflow on Intelligent Database Environment). In each single task, various actions can be easily specified and, in any case, it is possible to write a custom .NET code;

- josh monitor ensures that the system is monitored in terms of processes, tasks, actors and it makes it possible to manage exceptions at the normal execution speed. It provides statistical data for assessment of the work performed by company personnel and to make efficiency calculations, to provide objective and automatic data for ABC (Activity Based Costing) industrial accounting.

The JOSH project within Drive Service involved an external partner, i.e. a medium-sized Italian consulting company of Business & Technology Management (AGIC) and an internal team of IT specialists. The project was internally coordinated and supervised by the Business Process Owner, a young engineering with deep experience in the automotive sector who also held the post of Human Resources

Manager. The involvement of management was essential to the definition of business process starting from a de-structured basis. Before the introduction of JOSH, the electronic documentation in the firm was realized through relying on a number of "home-made", mixed and not integrated archives containing a variety of documents and other not structured data. This situation was at least in part also the result of the acquisition of a few firms. Archives were geographically located in different offices and the distribution of document was muddled and inefficient. Physical spaces to archive new documents had become saturated and starting from July 2009 it was impossible to store additional paper documents. Accordingly, the so-called "paperless organization" become a strategic goal for the firm. There was an objective difficulty in logically cluster documents according to classification criteria, such as kind of activities, clients or providers. In more general terms, the firm did not own tools to track, manage and control organizational processes. These problems were particularly witnessed with specific regard to authority-related processes, where the rapid firm growth and the market innovation had inevitably contributed to higher volume and variety of documents as well as to higher need to codify and control processes performance.

Josh presented itself as graduated and flexible platform of workflow management that could be expanded as the company grows and that offered the possibility of updating business processes with new workflows without programming skills. Its future use was associated to a number of benefits both in the short and long term horizon. In particular, it would enable efficient document flow management and automation, a rapid return on investment thanks to the automation of workflows and the maintenance of company knowledge, the maximum protection and confidentiality in data management and the possibility for the management of keeping tabs on process advancement, task execution and the knowledge utilized/produces as well as obtaining statistics on the processes and resources and make more efficient calculations and accounting activities.

Furthermore it has a number of technical advantages. Firstly, it was integrated with Microsoft products and more specifically with MOSS 2007 i.e. the most preferred technology for the development of collaboration and content management solutions. It was also perfectly integrated with the ERP system chosen by the company (i.e. Microsoft Navision). Josh was compatible with all of the most important market standards (such as XML, SQL or .NET) and was interoperable with Windows

Worflow Foundation. Being a distributed system, it worked on intranet/extranet networks based on Microsoft operating environments and Internet Browsers, was integrated with the most commonly used personal productivity environments (Microsoft Office System). Also in terms of system requirements, both josh server and client's components required widely adopted software solutions commercialized by Microsoft (es. Microsoft Windows server, Microsoft Windows system based personal computers, MOSS 2007). It was also chosen because was viewed as flexible to be adapted and personalized to all needs and especially because business processed could be developed "ad hoc", on a case-by-case basis. Finally, the additional component joshArchive! could be integrated with the ERP Microsoft Dynamic Navision.

Before being introduced in the Maintenance office, Josh had been already adopted with success for the registration of passive documents (mainly invoices). The cited benefits were:

- an increase in the volume of recorded documents on equal time;
- a rationalization of activities since users work (anomalies and registration) only on document related to their competences (through the dynamic assignment of tasks);
- a rationalization of spaces: desks and drawers emptied and documents arrive at operators directly in a digital format, already indexed in a given form of Navision;
- a cost reduction, since DS can recorder and archive its document in house, without relying on an outsourcer.

The idea was to define an extensive development plan that was able to ensure the embedding of the new platform, so as to increase the return of investment. Josh was also viewed as an occasion to re-design business processes, the organizational structure and the documental models in a coherent and flexible manner. With specific regard to the maintenance authority processes, the management expected in the immediate term to:

- increase the productive capacity although relying on equal resources;
- a higher control of the process in all its stages so as to monitor deviations and bottlenecks;

- the possibility to monitor the efficacy and effectiveness of internal structures allocated to the single activities (performance measurement);
- a higher flexibility in adapt processes to organizational needs;
- an easier definition of roles and responsibilities.

Next to short-term advantages, top management also expected middle/long terms benefits, such as:
- to enhance the document management as an organizational heritage, providing new business opportunities and a higher reactivity to market demand;
- strengthen a communication platform both internally and externally that was coherent with business needs and provide higher visibility;
- encourage users to be more confidential and comfortable with the management of codified processes through structured workflows so as to make the firm shorter and more collaborative;
- share documents and information in a more structured manner, both within and outside the firm, managing them as simple Office files.

With specific regard to authority-related processes, JOSH would bring a number of operational advantages compared to the old HDA system. First of all, it could ensued the clustering of the submitted requests so that they could be assigned to specialists according to pre-defined rules. The top management (in particular the Operative Director and the Process Owner Manager) used the "Josh effect" in order to re-design authority related processes and this implied new procedures as well new labour division criteria that the software platform would have enabled and enhanced. Firstly, according to the management, the replacement of HDA with Josh to process authority tickets would strategically foster the shift from a "pull" to a "push" processing logic for users in the Maintenance Offices. Indeed, through the old system all requests, both general and technical in nature, were indistinctly channelled into an inbox. This worked as a large container and each operator was actually free to choose which ticket to assign to himself or even release a ticket in the inbox without starting its processing. Clearly, this potential behaviour did not ensure a balanced workload among operators and more complex, special (e.g. those including special penalties for delays) or solicited requests risked to be ineffectively delayed. In order

to rationalize the authority processes, all submitted requests had to be firstly analyzed in their content and then classified according to pre-defined criteria so as to simplify and allocating their subsequent processing to the most appropriate specialists. To this end a new (not existing yet) operative role was fixed up within the Maintenance Office: one or more people would be assigned the task of validating all submitted requests so that they could be subsequently self-assigned by workers according to their competences. Furthermore, the validator could also assign a priority level to a specific request making it visible to all users. In a pre-implementation stage, classification criteria or priority rules did not have been established yet neither who workers would have hold the described role. However, the basic principle was to ensure that authority requests were assigned to specialists in the II-technical level or, alternatively, to the I-technical level according to the relative complexity of the submitted request. It is worth highlighting that according to the Operative Director, the validation stage was not viewed as particularly complex and did not require any particular skills (he used the adjective "bovine" to describe this activity). Accordingly, one or more workers in the I-technical level group would have be assigned to carry on validation tasks. As for the subsequent processing stage, although each operator could freely self-assign any requests within the validated tickets in JOSH inbox, actually the system made workers more accountable through controlling that they actually respect the rule of adopting temporal criteria in choosing tickets. Once assigned a ticket, all main steps were rigidly imposed to operators so that the system enabled to track each step. In this respect a technical manual for using Josh was provided by the IT consulting firm for helping workers in familiarize with it.

The implementation of the new system would have supported the strengthening of a dual operative authority structure, viewed as more suitable to cope with increasing volumes and complexity. In this respect, the first level had to receive all requests, validate them and handle less complex requests submitted by phone in defined scope of autonomy; the second level would handle more complex requests ad manage operational relationships with customers. Another important expected benefit was a more effective document management for the registration and retrieval of documents and multimedia files. In this respect, through its tracking functions, Josh potentially ensued that all documents were correctly registered and easy to retrieve from the server so putting an end to the use of personal e-mail to transfer files, such as photos,

certificates and other authority-related documents, that often led to miss them or not having them stored according to precise and efficient rules.

The social interaction stage and the emerging technology and routines in practice

The implementation simultaneously started in both Maintenance Offices although the validation stage was initially tested through assigning it to the II-technical level. Indeed both the Process Owner Manager and the Maintenance Office Chief and middle managers believed that more experienced specialists were more suitable to evaluate the correct system functioning, identify problems and suggest material modifications for the system to the IT development group. Technical and operational problems were early witnessed in both Maintenance Offices. Empirical evidence about this stage primary come from participant observation, informal conversations with workers in the I technical level and formal semi-structured interviews with top and middle management, i.e. the Maintenance Office Chief, the two office managers as well as with the IT Manager.

From a technical point of view, during the two months immediately after its implementation the software platform showed a number of malfunctions such as long elaboration times, process slowing down, system crashes and documental loss. Some key functions such as the automatic generation of an ID number for each validated ticket, the electronic search of specific tickets in the Josh inbox or the documental record keeping did often fail and this inevitably created trouble to daily operational routines. In this respect, both Office managers expressed concern about these functional flaws. In particular they were afraid that the top management had underestimated the ordinary average production volumes associated to authority requests and that the available old servers were not large enough to manage them. Similar feelings were shared among users. Indeed, after the new system implementation, HDA was completely dismissed and all submitted requests were directly channelled into the new software platform. This meant that workers could not rely on the old system to workaround unexpected situations and technical malfunctions directly impacted overall workload, contributing to create delays, claims and then an increasing backlog, so reinforcing a vicious cycle of time-pressure, worsening work conditions and dissatisfaction among them as well as among suppliers and customers. Next to technical problems, that neither middle managers nor workers could effectively face, a number of material constraints were

perceived by users during its adoption. Indeed, differently from HDA, where users had always access to all tickets once they had been sent, Josh worked as a "black-box", since its functioning was largely hidden to workers, who exclusively used the client module. The observation phase revealed that although this module enabled to visualize the actual advancement stage of the process, users did not exploit this technical function to attempt understanding what was happening to the process. The validation stage revealed a number of difficulties and operative obstacles. In this respect a number of classification criteria and procedural rules were established and mainly transferred by e-email to the two respective managers of both Maintenance Offices and workers. Indeed, according to the new procedures, tickets consisting of documents, photos, certificates, declarations, etc. that were logically related to previously received authorization requests had to be anchored to them during the validation stage. However, the system did not alert the worker about pre-validated tickets concerning the same vehicle and he was constrained to manually search it by car's number. In this respect, Josh did not offer an integrative functionality compared to HDA. If the described situation simply did not foster process efficiency, other problems negatively affect process effectiveness and service level and were consequently viewed by users as more serious to address. In particular, tickets could be searched by car's number or also authorization number only if they have been already validated and this could create trouble when operators received reminders by suppliers or customers since they were not able to immediately process the solicited request. Indeed some workers believed that, similarly to Josh, also HDA presented itself as a more flexible tool that could potentially serve the function of validating task although without creating, differently from Josh, any obstacles in searching tickets as needed since it was a totally transparent artefact. Another system constraint emerged when the same request was re-submitted by a network agent. This situation usually happened in two cases: i) the supplier, after sending a written request by fax or e-mail, had waited for a long time without receiving any answer and, accordingly, he decided to re-submit it to solicit his request; ii) although the authority request should be submitted by phone since its overall amount was under the established threshold value, they chose to use the fax/e-mail channel to save time (especially in some time slots when all telephone lines were often engaged). In these cases, the system did not automatically recognize, eliminate or alert about equivalent requests

so that the workers assigned to the validation stage could not directly eliminate copies, being obliged to reworks and assign them to the I or II technical level.

Josh was designed to enable the assignment of a priority level to submitted requests. However, in the validation phase, workers could only know that requests submitted by some typologies of customers needed to be processed as soon as possible in order to avoid penalties payments for the firm and for these cases they had still to rely on their memory and experience since the system did not automatically recognize them. However, penalties were not applied for all vehicles and it was difficult to manage high contractual variety also for the same customer. For all already validated requests solicited by network agents, the priority level could not be changed anymore and to this end the request should be sent again to the validation stage, so slowing down the overall delivery time. Additionally, also when a ticket was in a priority status, the system was not graphically efficient in visualizing it to workers, who usually tended to ignore urgent requests.

According to the office manager of the I-technical level office, a number of technical and operational problems met by users after the implementation of Josh platform could be viewed as a consequence of their scanty involvement in the development stage. Indeed, he complained that there had been no formal anticipation for workers about the forthcoming replacement of HDA neither methodical training sessions about the use of the new artefact. Informal conversations with workers revealed that they tended to enhance HDA flexible features compared to JOSH. Indeed, among workers it was largely spread the opinion that the new system did not add significant new functionalities and that was not suitable to face the high variety and changing status of processing requests. Conversely, through its flexible nature the old system could actually support the deliberate changes in organizational routines. For example, HDA could serve the function of validating tickets without working as a black-box. Workers and middle managers also complained that HDA had been introduced just one year before and that the introduction of Josh largely defeated all their efforts made to adapt, modify and exploit HDA capabilities in order to improve their authority tasks. Also with specific regard to the registration and retrieval capabilities enabled by the documental module of the new artefact, it is worth highlighting that, according to workers, this functions were inscribed also in the old HDA system. Although, differently from HDA, the new system constrained workers to link documents to the related authorization requests, they could actually

workaround this constraint by relying on personal e-mail to transfer documents. Indeed, also in these cases, documents risked to not be attached to related requests and not correctly archived. However, this procedure was viewed necessary when excessive workload constrained workers to avoid Josh use to reduce delivery times and evaluate additional documentation as soon as possible in order to close the related dossier.

Starting from October 2010 - four months after Josh implementation within the Maintenance offices – an unexpected event "broke down" both daily operational routines and technology use. The firm had to change its contractual conditions with the business partner FiatAutovar (FAV) with regard to specific combinations of maintenance operations/vehicles used by the Public Administration in order to ensure a positive ratio between related profits and overall costs. Unexpectedly, these combinations revealed themselves so highly frequent that Drive Service was obliged to dismiss the existing contractual clauses (i.e. full services in return for a standard fee) shifting to more open contracts. According to the new clauses, pre-defined performances were not included yet in the annual fee but would have been charged directly to FAV. However, before releasing authorizations for these pre-defined cases, labelled "addendum", authority team's workers had to collect a precise list of documents and photos that needed to certify the reliability of the request and the actual state of the concerned vehicle. The exact procedure to adopt was established by the maintenance office Chief and sent to all authority team's workers by e-mail. After two months the situation become also worse and the list of addendum items grow from 11 to approximately 50. The new operative conditions contributed to exacerbated an already crucial situation, putting both workers and network agents to a lot of trouble. Indeed, collecting all required documentation with regard to addendum items was a very time-consuming activity. In the validation stage, all addendum items as well as related documents had to be recognized and named appropriately so as to make them visible to workers in the processing stage. Subsequently, since it was necessary to verify that all documents have been correctly sent by network agents, authorization times become longer and reminders significantly increased. This led to a "time-pressure" state, that was witnessed especially in the I-technical level office, since it was also a front-office structure and had to receive all requests and claims submitted by agents and end customers. For network agents the new imposed rules contributed to create confusion, disorientation

and annoyance since for a number of addendum items they were used to simply submit a request by phone and then to receive an authorization in a very short time. The participant observation revealed that workers had difficulty in react to the new pressing conditions but they also were aware that Josh rigidity did not help them to find suitable solutions. A further difficult arose since the Maintenance office Chief did not agree with the Operative Director about the value added to the authority processes by the validation stage. Indeed he was firmly convinced that workers assigned to this stage should be highly skilled because it was not a "bovine" activity. Conversely, it required a very deep knowledge about contractual details, customers, special vehicles, etc. Accordingly, rather that assigning this role on a random base to all workers, he designed two operators for this role. However, informal conversation with them revealed that they found it alienating the validation activity and they preferred to process authority requests because it was viewed as a the only way to strengthen and develop further technical know-how rather than simply procedural knowledge about contracts, suppliers and customers.

The self-reinforcing dynamics: path-breaking vs path-dependence

The introduction of Josh was not a stand-alone process, since it was viewed by top management as a strategic occasion to "re-design" maintenance authority routines. Deliberate changes concerned both operative procedures, labour division rules and were aimed to ensure a higher rate of formalization and automation so as to to make processes more efficient, effective and easy to control. Josh would simplify work through both higher automation and rigidly guiding workers about specific step to follow. Accordingly, the framing was very strong and imposed through new rules inscribed in the system but also formalized in technical manuals and formal procedures. Since HDA was completely dismissed, workers could not choose to not rely on Josh, also because their work was strictly controlled through the new artefact. This did mean that the modified technology system was able to "break" incumbent learning mechanisms, also because all other technical components did not changed and were able to ensure a partial continuity with previous practice. However, workers were complained about the new system and did not understand its higher benefits in comparison to the old HDA system. Such feelings, together with the high rigidity and constraining features that they perceived led to a state of higher "laziness" in terms of attitude towards experimenting with the new system. Actually,

it caused a number of trouble and exacerbated also relationships with network agents. In few words, it was breaking but path-dependence showed through a reduced attitude of workers towards experimenting, exploring with the new system and to simply behave according to formal rules.

In the top management view, re-design authority-related routines would bring new organizational interdependencies. However, this would not necessary correspond to new coordination requirements since they expected that the new technological platform would enable workers to carry on their respective tasks in high autonomy. Actually, on the one hand the introduction of Josh enhanced old coordination patterns especially among I and II-technical levels offices; on the other hand it contributed to new coordination needs that were usually met through verbal communication within offices and mainly relying on the phone for information exchange among workers in the two maintenance offices, physically located in different places and geographical areas. In fact, the introduction of the new validation stage did not go together with the formal assignment of the new tasks to well-defined operators and, as a consequence, such a decision was exclusively made on a random and daily basis. Further interdependencies between the validation and the processing stages were also evident in case of reminders. In fact, whenever solicited requests had not been validated yet, these had to be searched by the validator so as to enable other workers to start their processing. With the increasing complexity of work routines, especially enhanced by the addendum items procedures, coordination needs between the I and II- technical levels also increased. Specifically, more skilled workers in the maintenance office in Rome increasingly often supported specialists in the maintenance office in Milan in handling more complex requests. Difficulties met in facing novel situations constrained workers to contact specific workers in the II-technical level office who had been assigned the role of responsible for specific groups of clients and that, as such, had to know in more-depth all contractual clauses and details about specific clients/vehicles. Within the offices, physical proximity was viewed as a valuable resource to share problems and novel situations and build collective knowledge and mutually support each other, especially with the introduction of strict rules about addendum items.

For top management, the new software platform did offer a number of complementary functions to incumbent technological artefacts. Indeed, it could be integrated with the ERP system already chosen by the firm(Microsoft Navision) and

its main tools, i.e. document management and workflow management, had already been successfully implemented in other organizational units in order to carry on some key business processes. Furthermore, it could be graduated as the company grow and decide to expand technology use throughout more services. Finally, with specific regard to authority processes, the top management planned to integrate the Josh platform with the SID information system. Through the direct and automatic communication between the two technological artefacts some process steps could be automated and the worker could avoid inserting the same data twice, simultaneously using both systems, simplifying the process and saving time.

Differently from top management, workers in the Maintenance Office adopted an agential "reflexivity" that tend to look more at present than at future. They were not enthusiastic about the new system and indeed often complained about its rigidity, closure and slowness. Conversely, they tended to enhance the functional advantage of the old HDA system, attaching high importance to its high flexibility and adaptability to authority requirements. For them, switching costs had resulted high and attached to the old system HDA a higher complementary value towards incumbent artefacts in comparison to the new software platform.

Previous expectations about technology and routines - formed and stabilized through using HDA- did not result easy to break down. Affordances and constraints of the new technological artefact were perceived by users in relation to old technological frames and specifically taking into account what the dismissed HDA system enabled to do especially in "time-pressure" contingent circumstances. However, they did not have the freedom of not using the new system and they were also aware that since it enabled to track their choices and actions they were much more accountable then before. The new technological framing was very explicit since it also went together new formal rules and procedures, a more hierarchical structure and a more precise division of tasks. Accordingly, it highly influenced the emergence of new expectations by users but these, that overall negative, tend to rapidly freeze just as a consequence of previously positive ones. Path dependence showed in the following way: new complementarities were judged necessary from users but expectations formed during the previous morphological cycle influence the rapidity with which new expectations adapt and so become difficult to change in future.

4.5.   Discussion and conclusion

We designed our study to understand how organizational routines and technologies co-create path-dependence in organizations. Scholars have recognized that, at firm level, path-dependence can be observed at both domains (Coombs & Hull, 1997); nevertheless, they have poorly addressed the dual-layer nature of the process and rather focused attention alternatively on routines (e.g. Levitt & March, 1988; Narduzzo et a., 2000) or technology (Murman & Frenken, 2006; Valorinta et al., 2011). The recent turn in organizational routine literature have called in question the distinction between routines and technologies (Leonardi, 2011). Opening the "black box" of both entities, many scholars are now looking at how they co-evolve and how their respective material and social dimensions interact (e.g. Pentland & Feldman, 2008; D'Adderio, 2011; Leonardi, 2011; Cacciatori, 2012). In these studies, a structuralistic perspective (Giddens, 1986) and a practice lens (Orlikowski, 2000) is often used to shed light on how "technologies-in-practice" and "routines-in-practice" emerge from repetitive social action (Feldman & Orlikowski, 2011; more recently, a critical realist ontology (Baskhar,1978; Archer, 1998) has also been embraced to understand the temporal co-evolution of technology and routines (e.g. Volkoff & Elmes, 2007; Faulkner & Runde, 2009; Leonardi, 2011).

Our empirical evidence adds to previous research on technologies and routines, investigating how their temporal co-evolution creates path-dependence in organizations. Differently from existing studies, we chose to not focus our attention only on a single enactment stage, as it is triggered by the adoption of a new technological artifact. Indeed, as previous research, we were also interested in understanding how, in each enactment phase, organizational routines were mediated by technology (e.g. Pentland & Feldman, 2008) and how technology became incorporated in work practice during the process of routinization (e.g. Orlikwowski, 2000; Vaast & Walsham, 2005). But, above all, our major aim was to shed light on how mechanisms of self-reinforcing that determine path-dependence at both routines and technology level work over time and how exogenous factors acting as triggering events (i.e. new technological shifts) influence these mechanisms, contributing to higher path-dependence or, conversely, acting in a path-breaking direction.

A first significant insight is related to the number and nature of self-reinforcing mechanisms that bring about path-dependence in organizational routines. Empirical

research have devoted most attention to showing how learning progressively reduced the space of exploration and prevents people to search alternative solutions or course of action (e.g. Levitt & March, 1988; Egidi & Narduzzo, 1997). Our empirical evidence supports the argument that learning effects are not the only self-reinforcing mechanism at work at organizational routine level (Becker, 2005; Sydow et al., 2009). Indeed, coordination, adaptive expectations and complementarity effects also play a key role in explaining path-dependent behavior and, when they work simultaneously, the effects of self-reinforcing dynamics are even more visible. In each of what we considered as a "morphogenetic cycle" (Archer, 1998), the addition (i.e. the fax technology and HDA) or substitution (i.e. IDRA/SID and HDA/JOSH) of a given component to the incumbent technological system puts into action a phase of change and mutual adaptation between the new technological configuration and local practices, as it has been found in relevant literature (Orlikowski, 1996; Tyre & Orlikowski, 1994; Baxter & Berente, 2010). However, our study adds to the above studies, providing insights about how the specific nature of technology - together with other contextual elements – can influence the direction and the intensity of the mutual adaptation process, progressively reducing the space of exploration and search opportunities. In Drive Service, all the described technological shifts correspond to the addition or substitution of a new technological artifact that served to support productive operations (i.e. authority-related processes). This makes out settings very similar to that investigated in Tyre & Orlikowski (1994), offering us the opportunity to make comparisons and add new insights. Specifically, we would expected that "production pressure" (in addition to self-reinforcing mechanisms) contributed to the rapid decline of mutual adaptation in all the examined morphogenetic cycles. However, the first technological shift, corresponding to the introduction of fax technology, produced quite different outcomes. In fact, although production pressure was also present, it did not impede the rapid decline of technological adaptation. Launched at the beginning of the year 2010, the experimental phase, a deliberate choice made by management, lasted over a year, involving a restricted group of workers and a selected number of trusted network providers (also having the role of distributing maintenance services to end users). During this period, through repetitive interaction patterns, workers could mindfully reflect about the more appropriate changes to implement in incumbent work procedures, coordination mechanisms, and protocols of knowledge exchange with

network agents. The shift from verbal to paper-based authority was the most significant change in the structural conditions and its adoption in daily practice brought to the surface a variety of new situations and problems to handle, like those deriving from network agents' inexperience with technical artifacts (e.g. wrong estimates or missing information in the submitted requests), the dispatching of submitted requests among workers, the material handling of claims. As a rule inscribed in fax technology, authority team's members could not search for alternative solutions to processing paper requests since it was the only procedure enabling off-line work and hence the accurate control of contractual details along with the technical evaluation of specific maintenance performances. For workers belonging to the experimental group, a major incentive to keep up with further adaptation through changes in work routines was the parallel authority-related practice carried on by other workers in the office who, in fact, continued to rely on the phone to process requests. Actually, this distribution of workload contributed to less "production pressure" conditions, and adaptation clearly benefited from this work environment. As we reported in the first enactment stage, the most relevant adaptive solution was the creation of a suitable space (the so-called X disc) where all information about contractual clauses were stored according to given criteria. Conversely, in the subsequent technological shifts, "production pressure" was constantly alive since workers were immediately put into condition to use the new technology solution that actually was designed to be an essential tool in authority processes. Precisely, as for HDA, authorization requests submitted through fax by network providers/distributors were automatically transformed in an electronic format and routed to HDA in the form of tickets. This means that workers could not turnaround HDA and continue to rely on fax technology to start processing requests. Regarding SID, although the old system IDRA was not dismissed (actually one of the author, involved in participant observation, noticed that workers in the office still had IDRA installed on their computers in the year 2010, i.e. after seven months from the introduction of SID within the Maintenance Office) and, in principle, employees could not stop using it, this actually did not happen. In this case, a major incentive was the fact that monitoring and performance analysis made by management were largely based on data stored in these technological systems (IDRA and, subsequently, SID). Accordingly, workers were very accountable and their behavior visible to managers. Finally, as for JOSH, only a brief experimental window saw the

simultaneous use of both the old (e.g. HDA) and the new system (e.g. JOSH) and also in this case workers' choices were easily traceable.

Previous research has argued that when the material agency of a technology is perceived by users as a constrain for the achievement of their goals and they do not reject it, they change their organizational routines maneuvering around technology (e.g. DeSanctis and Poole 1994; Boudreau and Robey 2005; Pentland & Feldman, 2008). In a recent study, Leonardi (2011) has challenged the traditional image of technology as a fix entity with fix material features inherent in these studies showing that if people can change the material agency of technology (because they have the capabilities to if by themselves or because there are resource available to change some technological features) they can choose alternatively to change technology or routines. Specifically, the authors argued that people construct a perception of technology or as constraining their goals, or affording the possibility of achieving new goals. In the first case they change the material features of technology, whereas in the last case organizational routines are the entity that changes. In his argument, the idea that routines and technology co-evolve in a path-dependent manner is captured by the metaphor of "imbrication". Indeed, at any given time, routines and technology form an infrastructure on which people draw to construct their perception of technology that, subsequently, guide their actions. Our empirical evidence confirms these previous results that path-dependence is simultaneously visible at technology and routine level and that they co-evolve influenced by previous imbrications. However, we also add to this study, because, rather than path-dependence, Leonardi's study reveals "past-dependence" in technologies and routines. In fact, he does not put attention to the self-reinforcing dynamics at work during each imbrications cycle, as we made in our study for each enactment stage. In our case study, the adoption of fax technology correspond to a situation more similar to those described in previous studies where technology adoption is simply an occasion for change organizational routines (e.g. Barley, 1986) triggering also new deliberate changes in the organizational structure. The actual infrastructure described by Leonardi (2011) is, at least partially, the result of the self-reinforcing mechanisms at work. Indeed, it will influence the perception of HDA in the subsequent enactment stage. Workers in the Maintenance Office experienced both constraints and affordances of the new tool, but rather than replacing a different way of processing requests (i.e. by phone) it contributed to create the organizational conditions to

develop new competences and capabilities, through focusing more on technical issues, acquiring a general overview of the contracts, familiarize with new providers/developers, specializing in commercial duties. The same "adding" and "not disruptive" mechanism was at work for coordination, complementarity and adaptation expectations effects. When HDA was introduced, although workers felt a little intimidated by the new tool, they early perceived it as affording new goals though a variety of new functions that it offered and, accordingly, they changed their routines and, without changing the material features of the tool, used it in unanticipated way. We can suppose that the resulting perception of the new productive tool was influenced by the effects that the previous infrastructure of technology (e.g. the fax together with IDRA and the phone) have produced in terms of learning, coordination, expectations and complementarity. Furthermore, we add to previous research showing that in addressing path-dependence of technology, it should be viewed as a systemic object whose components are gradually added or modified. It is important to underline this aspect, because, according to this perspective, perceptions of technology are not related to the new component in isolation, but formed looking at the technological system as a whole since the described self-reinforcing effects work at this "higher" level: using a specific tool alone is not the same that adding to other incumbent system, because new interdependences arise and the state of "taken for granted" or "ready at hand" achieved for a specific technology, at least partially challenged by the addition of new components and actually the component turns again in a state of "present-at-hand" (Knorr-Cetina, 2001). This situation is particularly visible with the technological shift from fax to HDA. Actually, before the adoption of the ticketing system, workers mainly used the phone for communication exchange with network agents ad this enabled them to close a given ticket once started its processing through complementing written information with those verbally exchanged. Since HDA made the information exchange with providers both direct and clear in its contents, the workers progressively reduced the use of phone. Such a situation even strengthened when the Maintenance Unit was split down into two geographically separate units. Actually, in this case workers in the II-technical level office stopped to manage direct relationships with providers, since any requests or claims was directly carried on by workers in the I-technical level/front office team. In this case, for technicians in the II-technical level office, the phone became again a "present-at-

hand" artifact also if no material changes were made in such a simple tool. The same happened for the IDRA system: since HDA supported the electronic transfer of documents (especially photos need for a more accurate evaluation of the state of the vehicle) as well as the chance to put in a "working state" a specific request while attending that such a documentation was received, a new coordination rules among workers was created, that is to insert information in a given space in IDRA related to the ticket partially worked in HDA. That is, after HDA, also the specific use of IDRA, an incumbent artifact, was modified by users. Before the subsequent technological shift (i.e. from IDRA to SID), both IDRA and HDA were installed also in the I-technical level office. Accordingly, HDA also became a coordination tool among the two offices. In particular, when the workload in the II-technical level was too high, some requests submitted by fax/e-mail by network agents were processed by more skilled workers in the front office. This means that new formal division of labor had triggered further technological adaptation, as foreseen by literature (Tyre & Orlikowski,1994; Orlikowski, 1996). However, workers do not only change organizational routines, but some changes were also made in the material features of HDA so as to adapt it to the authority process requirements.

Previous literature has showed that, after the implementation of a new information system, people usually cannot have its material features modified to fit their need and, accordingly, tend to change their routines (e.g. Orlikowski, 2000; Boudreau & Robey, 2005) and the material aspects circumscribe interactions between the ostensive and performative aspects (Volkoff et al., 2007). Leonardi (2011) documents a case where the same agents can easily have the material features of a technology modified. Our empirical case study shows how the inability of users to directly access to the script and modify the software cannot be turnaround simply changing their organizational routines. SID was introduced to simplify authority related work and reducing cognitive effort made by employees through automating some steps and making the search of information easier. In addition, it was also introduced to avoid that authorization requests were released where contractual conditions were not respected. However, workers reported that the system often fails because it was not able to manage the high variety of contractual details and correctly evaluate all the needed checks. Operators were sometimes materially prevented to close the request and release the authorization, because the system did not generate the authorization number. In these cases, changing the material make up

of technology was the only way to have the problem solved and this require the action of developers and the deployment of IT resources. Since such an operation was systematically made, workers were obliged to additional work, since they have to consult contractual details in the X disc, since they could not trust the checking capabilities of SID, verify if the system worked correctly and in case of failure inform the IT group so as to modify the material features of the technological artifact. Also for SID, our study reveals how the perception of technology by people was influenced by the incumbent infrastructure constituted by technologies and routines and, precisely, can be related to self-reinforcing mechanisms described in relevant literature. Specifically, as for learning SID did not disrupt acquired knowledge and work procedures neither it was difficult to learn in itself. The interface was much easier that IDRA whereas interdependences with HDA could be managed in a similar way. In terms of expectations and complementarities, the new system was not viewed as a revolutionary tool compared to IDRA, even though, as for managers, IDRA had to be necessarily dismissed. The huge effort made to adapt HDA to authority related processes and the subsequent additional work that SID required (because of systematic failure) were, probably, among the major factors influencing the technological shift to JOSH together with the inherent constraining features of SID. Indeed, with the introduction of the new system, self-reinforcing mechanisms at the level of technology and routine. i.e. at the operative level work differently than at the strategic level. Workers in the Maintenance Office evaluated the new system in light of the incumbent technological system at hand and routines in practice. Although they could not choose to reject the new system in carrying on authority tasks, they actually were neither in the position to directly change its material features. Indeed, during the first two months of actual use, when the materiality of technology was perceived as highly constraining, a dialogue between the authority team and the developers enabled some changes in the make-up of technology. However, the requested changes were not easily and rapidly implemented and this led to many trouble in managing authority tasks due to bottlenecks, re-works and the consequent increase in lead times, re-submissions and claims by both assistance points and end users. To some extent, workers tried to tackle work disruptions and unexpected situations with some changes in organizational routines. Imposed rigidity in both technology and rules made this adaptation difficult to realize. However, our empirical findings suggest also a further

explanation to this reduced adaptation capability. Indeed, all self-reinforcing mechanisms at work were perturbed by the new technological shift in a way that led to more morphostasis. Precisely, as for learning effects, the huge investment previously made in learning how to use HDA and adapt it to authority tasks made workers not enthusiastic at changing it for JOSH just after a year. Josh was seen as inflexible and even not able to solve the main problem inherent to HDA: the system crashes when the server was overload by documents and submitted estimates. In addition, workers thought that the new procedural rules could be managed also through relying on the old HDA. This resulted in a reduced attitude toward find alternative solutions to maneuver the material constraints of the new technological artifact. With regard to coordination mechanisms, the material constraints imposed by Josh did not reduce coordination needs among workers but, conversely, reinforced old routine patterns making them more visible and created new organizational interdependencies among specific subroutines. Josh was not perceived by them as providing synergic value to incumbent technical artifacts compared to HDA and negative performance outcomes in authority related processes contributed to reinforce the technological frame adopted to evaluate the new system. Such a situation probably contributed to a shorter routinization and space of exploration on the part of workers even though a number of problems had remained unsolved.

To conclude, our study has added new insights in the process of path-dependence that occurs at the level of technology and routines in the organization. More specifically, the empirical results helped us to cast light on how the self-reinforcing mechanisms that gradually restrict the range of possible actions simultaneously work, often in conjunction, at the level of both technologies and routines. Accordingly, these two entities should be empirically investigated not in isolation but taking into account their co-evolutionary paths also when the research aim is to understand the dynamics of path-dependence at micro level in the organizations. In this respect, the adoption of a critical realist perspective has revealed itself as particularly suitable to explore such a co-evolutionary paths over time. More importantly, the research has showed how the effective impact that self-reinforcing mechanisms have on strengthening or reducing morphogenesis depends not only on how they work after that a new exogenous event has triggered a new transformational cycle of technologies and routines in practice but to some extent it should be put in relation to how these mechanisms were already working with the incumbent system of

technologies and routines. Indeed, they influence the direction and rapidity with which the space of exploration actually narrows down in subsequent morphogenetic cycles, affecting organizational adaptation capability.

References

Abelson, R.P. 1981. Psychological status of the script concept. *American Psychologist*, 36(7): 715-729.

Adler, P. , Goldoftas, S. B., Levine. D. I. 1999. Flexibility versus efficiency? A case study of model changeovers in the Toyota production system. *Organization Science*, 10(1): 43–68.

Aguinis, H. 2009. Performance management (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Archer, M. 1998. Realism and Morphogenesis. In M. Archer, R. Bhaskar, A. Collier, T. Lawson and A. Norrie, *Critical Realism: Essential Readings*. London: Routledge.

Argote, L. 1999. *Organizational Learning: Creating, Retaining and Transferring Knowledge*. Kluwer, Norwell, MA.

Armbruster, H., Bikfalvi, A., Kinkela, S. and Lay, G. 2008. Organisational innovation: The challenge of measuring non-technical innovation in large-scale surveys. *Technovation* 28: 644–657.

Argyris, C., Schon, D. A. 1978. *Organizational learning*. Reading, MA: Addison-Wesley.

Arthur, W. B. 1988. Urban Systems and Historical Path Dependence. In Ausubel J.H., Herman. R. (eds.) *Cities and Their Vital Systems: Infrastructure Past, Present, and Future*. Washington: National Academy Press.

Arthur, W.B. 1994. *Increasing Returns and Path Dependence in the Economy*. Ann Arbor: University of Michigan Press.

Ashforth, B.E. and Ravid, G. (1986), Poor service from the service bureaucracy: the role of mindlessness, *Academy of Management, Proceedings of the Annual Meeting*, 166-9.

Ashforth, B.E. 1988. The Mindlessness of Organizational Behaviors, *Human Relations*, 41 (4):305-329

Balogun, J., & Johnson, G. 2005. From intended strategies to unintended outcomes: The impact of change recipient sensemaking. *Organization Studies*, 26:1573–1601.

Barley, S. R. 1986. Technology as an occasion for structuring: Evidence from observations of CT scanners and the social order of radiology departments. *Administrative Science Quarterly*, 31: 78–108.

Barley, S. R. 1990. The alignment of technology and structure through roles and networks. *Administrative Science Quarterly*, 35: 61–103

Barley, S.R., Tolbert, P.S. 1997. Institutionalization and Structuration: Studying the Links between Action and Institution. *Organization Studies*, 18(1):93-117.

Barras, R. 1986. Towards a theory of innovation in services. *Research Policy,* 15 (4):161–173.

Barras, R. 1990. Interactive innovation in financial and business services: The vanguard of the service revolution, *Research Policy*, 19 (3):215-237.

Baxter, R. J., Berente, N. 2010. The process of embedding new information technology artifacts into innovative design practices, *Information and Organization,* 20 (3-4):133-155.

Bhaskar, R. 1978. *A realist theory of science*. Hassocks: Harvester Press.

Becker, M.C. 2004. Organizational routines. A review of the literature. *Industrial and Corporate Change*, 13(4): 643–677.

Becker, M.C. 2004. Becker, M.C. 2005. A framework for applying organizational routines in empirical research: linking antecedents, characteristics and performance outcomes of recurrent interaction patterns. *Industrial and Corporate Change*, 14: 817–846.

Becker, M.C., Lazaric, N., Nelson, R.R., & Winter, S. G. 2005. Applying organizational routines in understanding organizational change. *Industrial and Corporate Change*, 14:775-791.

Becker, M.C. & Zirpoli, F. 2008. Applying organizational routines in analyzing the behaviour of organizations. *Journal of Economic Behavior & Organization,* 66:128-148.

Beckman, C. M., Burton. M. D. 2008. Founding the future: Path dependence in the evolution of top management teams from founding to IPO. *Organization Science.* 19(1) 3–24.

Berry, L. L. 1980. Services Marketing Is Different. *Business Week* (May-June): 24-29.

Beyer, J. 2010. The same or not the same - on the variety of mechanisms of path dependence. *International Journal of Social Sciences*. 5 (1): 1-11.

Betsch, T., Haberstroh S., Glöckner A., Haar T., Fiedler K. 2001. The Effects of Routine Strength on Adaptation and Information Search in Recurrent Decision Making, *Organizational Behavior and Human Decision Processes*, 84 (1): 23-53.

Betsch, T., Haberstroh, S., Hohle, C. 2002. Explaining Routinized Decision Making: A Review of Theories and Models, *Theory Psychology*, 12 (4):453-488.

Bettencourt, LA., Ulwick,A.W. 2008. The Customer-Centred Innovation Map, *Harvard Business Review*, May:108-114.

Bitner, M. J, Booms, B.H., Tetreault, M.S.1990. The Service Encounter: Diagnosing Favorable and Unfavorable Incidents. *Journal of Marketing*, 54:71-84.

Bitner, M. J. 1990. Evaluating Service Encounters: The Effects of Physical Surroundings and Employee Responses, *Journal of Marketin*g, 54 (2): 69-82.

Bitner, M. J., Booms, B.H. Mohr, L.A. 1994. Critical Service Encounters: The Employee's Viewpoint, *Journal of Marketing,* 58 (4):95-106.

Boudreau, M.-C., D. Robey. 2005. Enacting integrated information technology: A human agency perspective. *Organization Science*, 16(1) 3-18.

Bitner, M.J., Ostrom, A., and Morgan, F. 2008. Service Blueprinting: A Practical Technique for Service Innovation. *California Management Review*, 50(3): 66-94.

Bowen, J. 1990. Development of a taxonomy of services to gain strategic marketing insights. *Journal of the Academy of Marketing Science*, 18 (1):43-49.

Broderick, A.J. 1998. Role theory, role management and service performance. *Journal of Services Marketing*, 12 (5):348-361.

Bullinger, H.J., Fähnrich, K.P., Meirena, T. 2003. Service engineering—methodical development of new service products. *International Journal of Production Economics,* 85 (3):275–287

Buzacott, J.A. 2000. Service system structure. *International Journal of Production Economics*, 68:15-27.

Cacciatori, E. 2012. Resolving Conflict in Problem-Solving: Systems of Artefacts in the Development of New Routines, *Journal of Management Studies*, accepted article.

Carbone, L.P., Haeckel. S.H. 1994. Engineering Customer Experiences. *Marketing Management*, 3 (3): 9–19.

Castaldi, C., Dosi, G., Paraskevopoulou, E. 2011. "Path dependance in technologies and organizations: a coincise guide", *LEM Working Paper Series*, May

Chase, RB. 1978. Where does the customer fit in a service operation? *Harvard Business Review* 56(6):137-42.

Chase, R.B. 1981.The Customer Contact Approach to Services: Theoretical Bases and Practical Extensions, *Operations Research*, 29 (4):698-706.

Chesbrough, H. 2011. *Open Services Innovation. Rethinking Your Business to Grow and Compete in a New Era*. San Francisco: Jossey –Bass.

Clark, G., Johnston, R., Shulver, M., 2000. Exploiting the service concept for service design and development. In: Fitzsimmons, J., Fitzsimmons, M. (Eds.), *New Service Design*. Sage, Thousand Oaks, CA, pp. 71–91.

Cohen, W. M., Levinthal, D. A. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*. 35: 128-152.

Cohen, M.D. 1991. Individual Learning and Organizational Routine: Emerging Connections. *Organization Science,* 2 (1):135-139.

Cohen, M. D., Burkhart, R., Dosi, G., Egidi, M., Marengo, L., Warglien, M., & Winter S. 1996. Routines and other recurring action patterns of organizations: Contemporary research issues. *Industrial and Corporate Change,* 5: 653–697.

Collier, D.A. Meyer, S. M. 1998. A service positioning matrix, *International Journal of Operations & Production Management*, 18(12):223 -1244.

Cook, D.P., Goh, C., Chung, C.H. 1999. Service typologies: a state of the art survey. *Production and Operations Management*, 8 (3):318-338.

Coombs, R., Hull, R. 1998. Knowledge Management practices and path-dependency in innovation. *Research Policy*, 27: 237-253.

Coriat, B., Dosi, G. 2002. The Nature and Accumulation of Organizational Competences/Capabilities, Revista Brasileira de Inovação, 1 (2):275-326.

Creswell, J., & Miller, D.2000. Determining validity in qualitative inquiry. *Theory Into Practice,* 39: 124–130.

Crevani, L, Palm, K., & Schilling, A. 2011. Innovation management in service firms: a research agenda. *Service Business,* 5:177-193.

Cyert, R. M., & March, J. G. 1963. *A behavioral theory of the firm*. Cambridge, MA: Blackwell.

D'Adderio, L. 2003. Configuring software, reconfiguring memories: the influence of integrated systems on the reproduction of knowledge and routines. *Industrial and Corporate Change*, 12 (2):321-350.

D'Adderio, L. 2008. The performativity of routines: Theorising the influence of artefacts and distributed agencies on routines dynamics, *Research Policy*, 37 (5):769–789.

D'Adderio, L. 2011. Artefacts at the centre of routines: performing the material turn in routines theory. *Journal of Institutional Economics*, 7(2): 197-230.

David, P. A. 1985. Clio and the economics of QWERTY. *American Economic Review*, 75:332-337.

de Brentani, U. 1993. The New Product Process in Financial Services: Strategy for Success. *International Journal of Bank Marketing*, 11 (3): 15 – 22.

den Hertog, P. 2000. Knowledge-intensive business services as co-producers of innovation. *International Journal of Innovation Management,* 4: 491–528.

den Hertog, P., Van der Aa, W., & de Jong, M. W. 2010. Capabilities for managing service innovation: towards a conceptual framework. *Journal of Service Management,* 21: 490-514.

Delmestri, G. 1998. Do all roads lead to Rome… or Berlin? The evolution of Intra and Interorganizational Routines in the Machine-building Industry, *Organization Studies*, 19 (4):639-665.

Denzin, N.K., & Lincoln, Y.S. 1994. *Handbook of Qualitative Research.* Sage: Thousand Oaks, CA.

DeSanctis, G., Poole M. S. 1994. Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory, *Organization Science*, 5 (2): 121-147.

De Vries, E. J. 2006. Innovation in services in networks of organizations and in the distribution of services. *Research Policy,* 35: 1037–1051.

Djellaj, F., & Gallouj, F. 2001. Patterns of innovation organisation in service firms: postal survey results and theoretical models. *Science and Public Policy,* 28: 57-67.

Djellal, F, & Gallouj, F. 2005. Mapping innovation dynamics in hospitals. *Research Policy,* 34: 817–835.

Dolfsma, W. 2004. The process of new service development- issues of formalization and appropriability. *International Journal of Innovation Management,* 8: 319-337.

Dosi, G., 1982. Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change. *Research Policy* 11 (3), 147–162.

Dosi, G., Marengo, L.1994. Some Elements of an Evolutionnary Theory of Organizational Competences. In England, R. W. (Ed.), *Evolutionary Concepts in Contemporary Economics*, Ann Arbor: University of Michigan Press.

Dosi, G., Nelson R., Winter S.G.(eds.) 2000. The Nature and Dynamic of Organizational Capabilities. Oxford/New York, Oxford University Press.

Drejer, I. 2004. Identifying innovation in surveys of services: a Schumpeterian perspective. *Research Policy,* 33: 551–562.

Droege, H., Hildebrand, D, Forcada, M.A.H. 2009. Innovation in services: present findings, and future pathways. *Journal of Service Management*, 20 (2):131-155.

Dyer, G.W. & Wilkins, A.L. 1991. Better stories, not better constructs, to generate better theory: A rejoinder to Eisenhardt. *Academy of Management Journal,* 16: 613–619.

Easingwood, C. J. 1986. New product development for service companies. *Journal of Product Innovation Management*, 3 (4): 264-275.

Echeverri, P. 2005. Video-based methodology: capturing real-time perceptions of customer processes, *International Journal of Service Industry Management*, 16 (2):199- 209.

Edgett, S.J. 1996. The new product development process for commercial financial services. *Industrial Marketing Management*, 25 (6): 507–515.

Edmondson A C., Bohmer R.M., Pisano GP. 2001. Disrupted Routines: Team Learning and New Technology Implementation in Hospitals, *Administrative Science Quarterly* 46 (4):685-716.

Edvardsson, B., & Haglund, L. 1995. Analysis, planning, improvisation and control in the development of new services. *International Journal of Service Industry Management,* 6: 24-35.

Edvardsson, B., & Olsson, J. 1996. Key concepts for new service development. *The Service Industries Journal,* 16: 140-164.

Edvardsson, B., Gustafsson, A., Roos, Inger. 2005. Service portraits in service research: a critical review. *International Journal of Service Industry Management*, 16 (1):107-121.

Egidi, M., Narduzzo, A., 1997. The emergence of path-dependent behaviors cooperative contexts.
International Journal of Industrial Organization, 15 (6): 677-709.

Eichentopf, T., Kleinaltenkamp, M., van Stiphout J. 2011. Modelling customer process activities in interactive value creation, *Journal of Service Management*, 22 (5):650-663.

Eiglier, P., Langeard, E. 1977. A new approach to service marketing", in Eiglier, P. et al.(eds), Marketing Consumer Services: New Insights, Marketing Science Institute, Cambridge, pp. 3-58.

Eisenhardt K. M. 1989. Building theories from case study research. *The Academy of Management Review,* 14: 532-550.

Eisenhardt, K.M., Tabrizi, B.N. 1995. Accelerating Adaptive Processes: Product Innovation in the Global Computer Industry. *Administrative Science Quarterly*, 40 (1): 84-110.

Eisenhardt, K. M., & Graebner, M. E. 2007. Theory building from cases: opportunities and challenges. *Academy of Management Journal,* 50: 25–32.

Emirbayer M., Mische, A. 1998. What is agency?American Journal of Sociology, 103 (4):962-1023.

Faraj, S., Kwon, D., Watts, S. 2004. Contested artifact: technology sensemaking, actor networks, and the shaping of the Web browser, *Information Technology & People*, 17 (2): 186 – 209.

Faulkner, P., & Runde, J. 2009. On the identity of technological objects and user innovations in function. *Academy of Management Review*, 34: 442-462.

Feldman, M. S. 2000. Organisational routines as a source of continuous change. *Organization Science,* 11: 611–629.

Feldman, M.S., Rafaeli, A. 2002. Organizational routines as sources of connections and understandings. *Journal of Management Studies*, 39(3): 309-331.

Feldman, M. S. 2003. A performative perspective on stability and change in organizational routines. *Industrial and Corporate Change,* 12: 727–752.

Feldman, M. S., & Pentland, B. T. 2003. Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly,* 48: 94–118.

Feldman M. S., Orlikowski, W.J. 2011. Theorizing Practice and Practicing Theory. *Organization Science,* 22 (5):1240-1253

Fließ, S., Kleinaltenkamp, M. 2004. Blueprinting the Service Company-Managing Service Processes Efficiently, *Journal of Business Research*, 57 (3):392-404.

Frauendorf, J. 2006. Customer Processes in Business-to-Business Service Transactions, Gabler, Wiesbaden.

Frei, F.X. 2006. Breaking the trade-off between efficiency and service. *Harvard Business Review*, 84 (11): 92-101.

Froehle, C. M., Roth, A. V. 2007. A Resource-Process Framework of New Service Development. *Production and Operations Management*, 16 (2): 169–188.

Fuglsang, L., Sørensen, F. 2011. The balance between bricolage and innovation: management dilemmas in sustainable public innovation. *The Service Industries Journal*, 31 (4): 581–595

Fynes, B., Lally, A. 2006. Innovation in services: from service concept to service experience. In *IBM Services Science, Management & Engineering Conference*. NY: Palisades.

Gadrey, J., Gallouj, F., & Weinstein, O. 1995. New modes of innovation. How services benefit industry. *International Journal of Service Industry Management,* 6: 4-16.

Gago, D., & Rubalcaba, L. 2007. Innovation and ICT in service firms: towards a multidimensional approach for impact assessment. *Journal of Evolutionary Economics,* 17: 25-44.

Gallouj, F., & Weinstein, O. 1997. Innovation in services. *Research Policy,* 26: 537–556.

Gallouj, F., & Savona, M. 2009. Innovation in services: a review of the debate and a research agenda. *Journal of Evolutionary Economics,* 19: 149-172.

Gallouj, F., Toivonen, M. 2011. Elaborating the characteristics-based approach to service innovation: making the service process visible. *Journal of Innovation Economics*, 8 (33-58).

Garud, R., Rappa, M. A., 1994. A socio-cognitive model of technology evolution: the case of cochlear implants. Organization Science 5 (3), 344–362.

Garud, R., Karnøe, P., 2001. Path creation as a process of mindful deviation. In: Garud, R., Karnøe, P. (Eds.), *Path Dependence and Creation*. Lawrence Erlbaum Associates Publishers, Mahwah, NJ: 1–38.

Garud, R., Jain, S., Kamaraswamy, A. 2002. Institutional entrepreneurship in the sponsorship of common technological standards: the case of Sun Microsystems and Java. *Academy of Management Journal*, 45: 196-214.

Giddens, A. 1984. *The constitution of society: Outline of the theory of structure.* Berkeley CA, University of California Press.

Gilbert, C. G. 2005. Unbundling the structure of inertia: Re-source versus routine rigidity. *Academy of Management Journal*, 48: 741–763.

Gioia, D.A. Poole, Peter, P.P. 1984. Scripts in Organizational Behavior, *The Academy of Management Review,* 9 (3):449-459.

Goldstein, S.M., Johnston, R., Duffyc, J., Rao, J. 2002. The service concept: the missing link in service design research? *Journal of Operations Management,* 20 (2):121-134.

Goodwin, C. 1996. Moving the drama into the factory: the contribution of metaphors to services research, *European Journal of Marketing*, 30 (9):13-36.

Gould, R. V., & Fernandez, R. M. 1989. Structures of mediation: A formal approach to brokerage in transaction networks. *Sociological Methodology,* 19: 89–126.

Greener, I. 2006. Path Dependence, Realism and the NHS. *British Politics*, 1:319-43.

Grönroos, C., Gummesson, E. 1985. The Nordic School of Service Marketing, in Grönroos, C., Gummesson, E. (eds), *Service Marketing – Nordic School Perspectives*, Stockholm University, Sweden, pp. 6-11.

Grönroos, C. 1990. *Service management and marketing. Managing the moments of truth in service competition.* Lexington, MA: Lexington Books.

Grönroos, C. 1998. Marketing services: the case of a missing product. *Journal of Business and Industrial Marketing*, 13 (4/5):322-338.

Grönroos C. 2006. Adopting a service logic for marketing. *Marketing Theory*, 6:317-333.

Gross, M.A., Pullman, M. 2012. Playing Their Roles. Experiential Design Concepts Applied in Complex Services, *Journal of Management Inquiry*, 21 (1): 43-59.

Grove, S.J. Fisk, R.P. 1983. The Dramaturgy of ServicesExchange: An Analytical Framework for Services Marketing. In Berry, L.L. Shostack, G.L., Upah G.D. (Eds.), *Emerging Perspectives on Services Marketing*, American Marketing Association, Chicago, pp. 45–49.

Grove, S. J., Fisk R.P. 1992. The service experience as theater. In Sherry, J. F. Jr., Sternthal B. (eds.), *Advances in Consumer Research,* Volume 19, , Provo, UT : Association for Consumer Research, pp: 455-461.

Grove, S.J., Fisk, R.P.1992. Observational Data Collection Methods for Services Marketing: An Overview. *Journal of the Academy of Marketing Science* 20 (3):217-224.

Gutek, B. A. 1995. *The Dynamics of Service: Reflections on the Changing Nature of Customer/Provider Interactions.* San Fransisco, CA: Jossey-Bass.

Haywood-Farmer, J.1988. A Conceptual Model of Service Quality. *International Journal of Operations & Production Management*, 8 (6):19-29.

Harris, R., Harris, K., Baron, S. 2003. Theatrical service experiences: Dramatic script development with employees, *International Journal of Service Industry Management*, 14 (2):184 -199.

Helfat, CE. 1994. Evolutionary trajectories in petroleum firm R&D. *Management Science* 40(12): 1720–1747.

Heskett, J.L. 1986. Managing in the Service Economy. Boston:Harvard Business School Press.

Hill, T.P. 1977. On goods and services. *Review of Income and Wealth*, 4, 315-338.

Hodgson, G. M., Knudsen, T., 2004. The firm as an interactor: firms as vehicles for habits and routines. *Journal of Evolutionary Economics*, 14, 281-307.

Hodgson, G. M. 2008. The Concept of a Routine. In M. C. Becker (Ed.), *The Handbook of Organizational Routines*: 15-29. Cheltenham: Edward Elgar

Howard-Grenville, J. 2005. The persistence of flexible organizational routines: The role of agency and organizational context. *Organization Science*, 16, 618–636.

Howells, J. 2000. Innovation and Services: new conceptual frameworks. *CRIC Discussion Paper*, 38, August.

Hubbert, A.R. Sehorn, A.G. Brown, S.W. 1995. Service expectations: the consumer versus the provider, *International Journal of Service Industry Management*, 6 1: 6 – 21.

Hutchby, I. 2001. Technologies, texts and affordances. *Sociology*, 35 (2): 441–456.

Jacqueline A., Williams, Helen H. Anderson. 2005. Engaging customers in service creation: a theater perspective, *Journal of Services Marketing*, 19 (1):13-23.

Johnson, S.P., Menor, L.J., Roth, A.V., Chase, R.B., 2000. A critical evaluation of the new service development process: integrating service innovation and service design. In: Fitzsimmons, J.A., Fitzsimmons, M.J. (Eds.), *New Service Development—Creating Memorable Experiences*. Sage Publications, Thousand Oaks, CA, pp. 1–32.

Kallinikos, J. 2004. Deconstructing information packages: Organizational and behavioural implications of ERP systems. *Information, Technology and People*, 17:8–30.

Kandampully, J.2002. Innovation as the core competency of a service organisation: the role oftechnology, knowledge and networks. *European Journal of Innovation Management*, 5 (1): 18-26.

Kannan, PK, Proenca, J.F. 2010. Design of service systems under variability: research issues. *Information System and E-Business Management*, 8(1):1-11.

Kannan, P. K., Healey, J. 2011. Service Customization Research: A Review and Future Directions. The Science of Service Systems, Service Science: Research and Innovations in the Service Economy, pp.297-324

Kellogg, D.L., Nie, W., 1995. A framework for strategic service management. *Journal of Operations Management* 13, 323–337.

Kingman-Brundage, J.1991. Technology, Design and Service Quality, *International Journal of Service Industry Management*, 2(3):47 – 59.

Knorr Cetina, K. (2001) 'Objectual Practice', in T. R. Schatzki, K. Knorr Cetina and E. von Savigny (eds.) *The Practice Turn in Contemporary Theory*, pp. 175–88. London: Routledge.

Koch, J. 2011. Inscribed Strategies: Exploring the Organisational Nature of Strategic Lock-Ins . *Organisation Studies*, 32 (3): 337-363.

Kotler, P. 1994. *Marketing Management: Analysis, Planning, Implementation, and Control*. 8th ed. Englewood Cliffs, NJ: Prentice Hall.

Kristensson, P., Matthing, J., Johansson, N. 2008. Key strategies for the successful involvement of customers in the co-creation of new technology-based services. *International Journal of Service Industry Management*, 19 (4): 474 – 491.

Kroes, P., Meijers, A. 2006. The dual nature of technical artefacts. *Studies in History and Philosophy of Science,* 37:1-4.

Lam, A., 2005. Organisational innovation. In J. Fagerberg, D. Mowery, & R. R. Nelson, (Eds.), *The Oxford Handbook of Innovation*: 115-147. Oxford: Oxford University Press.

Langeard, E., Eiglier, P., Servuction. *Le marketing des Services*, Wiley, Paris, 1987.

Latour, B. 2005. *Reassembling the social: An introduction to actor-network theory.* Oxford University Press, Oxford.

Lawson, C. 2008. An ontology of technology: artefacts, relations and functions, Techne´: *Journal
of the Society for Philosophy and Technology*, vol. 12 (1).

Lazaric, N. 2000.The Role of Routines, Rules and Habits in Collective Learning: Some Epistemological and Ontological Considerations. *European Journal of Economic and Social Systems*, 14(2):157-71.
Leonard-Barton D. 1992. Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal,* 13 (S1):111–125.
Leonardi, P.M. 2007. Activating the Informational Capabilities of Information Technology for Organizational Change, *Organization Science*, 18 (5): 813–831.

Leonardi, P.L. 2011. When Flexible Routines Meet Flexible Technologies: Affordance, Constraint, and the Imbrication of Human and Material Agencies. *MIS Quarterly*, 35(1): 147–167.

Levina, N. and Orlikowski, W.J. 2009. Understanding Shifting Power Relations within and across Fields of Practice: A Critical Genre Analysis. *Academy of Management Journal*, 52, 4: 672–703.

Levinthal, D. A. and J. G. March. 1993. The myopia of learning, Strategic Management Journal, winter special issue, 14: 95–112.

Levinthal, D. A. and Rerup, C. 2006. Crossing an apparent chasm: Bridging mindful and less mindful perspectives on organizational learning. *Organization Science*, 17: 502-513

Levinthal, D., Rerup, C. 2006. Crossing an apparent chasm: bridging mindful and less mindful perspectives on organizational learning. *Organization Science*, 17 (4):503-514.

Levitt, B., March, J.G. 1988. "Organizational Learning", *Annual Review of Sociology*, 14:319-340.

Levitt, T. 1972. Production line approach to services. *Harvard Business Review*, 50(5):41-50.

Lord, R.G., Kernan, M.C. 1987. Scripts as Determinants of Purposeful Behavior in Organizations, *The Academy of Management Review*, 12 (2):265-277.

Lovelock, C.H. Young, R. F. 1979.Look to consumers to increase productivity. *Harvard Business Review*, 57: 168-179.

Lovelock, C. H.1983. Classifying services to gain strategic marketing insights. *Journal of Marketing,* 47: 9-20.

Lovelock, C. and Gummesson, E. (2004), "Whither services marketing? In search of a new paradigm and fresh perspectives", *Journal of Service Research*., 7 (1):20-41.

MacCormack, A., Verganti, R. 2003. Managing the Sources of Uncertainty: Matching Process and Context in Software Development. *Journal of Product Innovation Management*, 20 (3): 217–232.

Maister, D. Lovelock, C. 1988. Managing Facilitator Services. *Sloan Management Review*, 23 (4):58-70

Malone, T.W., Crowston J., Lee K., Pentland, B., Dellarocas, C., Wyner, G., Quimby, J., Osborn, C.S. ,Bernstein, A., Herman, Klein, M., O'Donnell E.1999. Tools for Inventing Organizations: Toward a Handbook of Organizational Processes. *Management Science*, 45(3):425-443.

March, J.G., Simon, H.A. 1958. *Organizations*. Oxford, England: Wiley.

Markus, M. L., and Silver, M. S. 2008. A Foundation for the Study of IT Effects: A New Look at DeSanctis and Poole's Concepts of Structural Features and Spirit, *Journal of the Association for Information Systems*, 9 (10/11): 609-632.

Matthing, J., Sandén, B. Edvardsson, B. 2004. New service development: learning from and with customers. *International Journal of Service Industry Management*, 15 (5): 479 – 498.

Monteiro, E., Hanseth, O. Social Shaping of Information Infrastructure: On Being Specific about the Technology. In W. J. Orlikowski, G. Walsham, M. R. Jones and J. I. DeGross (eds.), *Information Technology and Changes in Organizational Work*, Chapman and Hall, London, 1996, pp. 325–343.

Miles, M.B., & Huberman, A. M. 1994. *Qualitative data analysis: An expanded sourcebook,* 2nd ed.Thousand Oaks: Sage Publications.

Miles, I. 2005. Innovation in Services, in J. Fagerberg, D.C. Mowery and R. R. Nelson (eds.), *The Oxford Handbook of Innovation*, OUP Oxford, pp.433-458.

Mills, P. K., Morris J.H. 1986. Clients as "Partial" Employees of Service Organizations: Role Development in Client Participation. *The Academy of Management Review*, 1(4):726-735.

Miner, A.S. 1991. Organizational Evolution and the Social Ecology of Jobs. *American Sociological Review*, 56:772-785.

Moorman, C., Miner, A.S. The Convergence of Planning and Execution: Improvisation in New Product Development. *Journal of Marketing*, 62:1-20.

Mohr, L.B. 1982. *Explaining Organizational Behavior,* San Francisco, CA: Jossey-Bass.

Murmann J. P., Frenken K. Toward a systematic framework for research on dominant designs, technological innovations, and industrial change. *Research Policy*, 35 (7): 925-952.

Mutch, A., Delbridge, R., Ventresca, M. 2006. Situating Organizational Action: The Relational Sociology of Organizations. *Organization*, 13 (5): 607-625.

Mutch, A. 2010. Technology, Organization, and Structure - A Morphogenetic Approach. *Organization Science*, 21 (2): 507-520.

Narduzzo, A., E. Rocco, M. Warglien. 2000. Talking about routines in the field: The emergence of organizational capabilities in a new cellular phone network company. In G. Dosi, R. Nelson, and S. Winter, eds. *The Nature and Dynamics of Organizational Capabilities*. Oxford University Press, Oxford, U.K. 27–50.

Narduzzo A., Rocco E., Warglien M. 2000. Talking about routines in the field: the emergence of organizational capabilities in a new cellular phone network company. In: Dosi, G. Nelson, R. Winter, S.(eds) *The nature and dynamics of organizational capabilities*, Oxford University Press.

Nelson, R. R., & Winter, S. J. 1982. *An evolutionary theory of economic change.* Cambridge, MA: Harvard University Press.

Nelson, R.R. 2009. Routines as technologies and as organizational capabilities. In Becker, M. and N. Lazaric (eds). *Organizational routines: Advancing empirical Research*, Edward Elgar, Cheltenham UK.

Northcraft, G.B., Chase, R.B. 1985. Managing Service Demand at the Point of Delivery. *The Academy of Management Review*, 10 (1):66-75.

Ocasio W. 1997. Towards an attention-based view of the firm. *Strategic Management Journal*, summer special issue, 18: 187–206.
OECD. 2005. *Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*.Oslo.

Orlikowski, W. J. 1992. The Duality of Technology: Rethinking the Concept of Technology in Organizations, *Organization Science*, 3 (3): 398-427.

Orlikowski, W.J. 1996. Improvising organizational transformation over time: A situated change perspective. *Information System Research,* 7: 63-92.

Orlikowski, W.J. 2000. Using technology and constituting structures. A Practice lens for studying technology in organizations. *Organization Science,* 11: 404–428.

Orlikowski, W.J., Iacono, C.S. 2001. Desperately Seeking the "IT" in IT Research - A Call to Theorizing the IT Artifact. *Information Systems Research*, 12(2): 121-134.

Ottenbacher, M. Gnoth, J., Jones, P. 2006. Identifying determinants of success in development of new high-contact services: Insights from the hospitality industry. *International Journal of Service Industry Management*, 17 (4): 344 – 363.

Page, S.E. 2006. "Path Dependence," *Quarterly Journal of Political Science*. 1: 87–115.
Papastathopoulou, P., Hultink, E. J. 2012. New Service Development: An Analysis of 27 Years of Research. *Journal of Product Innovation Management*. doi: 10.1111/j.1540-5885.2012.00944.x
Pavlov, A., & Bourne, M. 2011. Explaining the effects of performance measurement on performance: An organizational routines perspective. *International Journal of Operations & Production Management,* 31: 101 – 122.

Pekkarinen, S., Ulkuniemi, P. 2008. Modularity in developing business services by platform approach. *International Journal of Logistics Management*, 19 (1): 84-103.

Pentland, B. T., & Rueter, H. 1994. Organisational routines as grammars of action. *Administrative Science Quarterly,* 39: 484–510.

Pentland, B. T. 2003. Sequential Variety in Work Processes. *Organization Science*, 14 (5):528-540.

Pentland, B. T., M. S. Feldman. 2005. Organizational routines as a unit of analysis. *Industrial and Corporate Change*

Pentland, B. T., & Feldman. M. S. 2005. Organizational routines as a unit of analysis. *Industrial and Corporate Change,* 14: 793–815.

Pentland, B.T., Feldman, M.S. 2008. Designing routines: On the folly of designing artifacts, while hoping for patterns of action. *Information and Organization*, 18(4) 235-250.

Pentland, B. T., Yakura, E., & Singh, H. 2011. Services, processes and routines: Literature review and implications. *CONF-IRM 2011 Proceedings,* Paper 14. http://aisel.aisnet.org/confirm2011/14
Pickering, A. 1993. The Mangle of Practice: Agency and Emergence in the Sociology of Science, *The American Journal of Sociology*, 99 (3): 559-589.

Pinch, T. & Bijker, W.E. 1987. The social construction of facts and artifacts: Or how the sociology of science and the sociology of technology might benefit each other. In Bijker, W.E., Hughes, T.P., & Pinch, T. (Eds.). 1987. *The social construction of technological systems*. Cambridge, MA: MIT Press.

Pine, B. J., Gilmore, J.H.1999. *The Experience Economy: Work Is Theater and Every Business a Stage*. Boston: Harvard Business School Press.

Ponsignon, F. Smart, P.A. Maull, R.S. 2011. Service delivery system design: characteristics and contingencies. *International Journal of Operations & Production Management*, 31 (3): 324-349.

Proctor, R.W., Dutta, A. 1995. Skill Acquisition and Human Performance, London: Sage.

Pullman, M. E., Gross, M. A. 2004. Ability of Experience Design Elements to Elicit Emotions and Loyalty Behaviors. *Decision Sciences*, 35 (3):551–578.

Quinn, J.B., Doorley, T.L., Paquette, P.C. 1990. Technology in services: Rethinking strategic focus. *Sloan Management Review*, 31(2):79-87.

Rathmell, J.M. 1966. What Is Meant by Services? *Journal of Marketing*, 30: 32-36.

Read, P. 2000, An information perspective on dynamic efficiency in environmental policy, *Information Economics and Policy*, 12 (1): 47-68.

Reed, M.I. 1997. In Praise of Duality and Dualism: Rethinking Agency and Structure in Organizational Analysis. *Organization Studies*, 18 (1): 21-42.

Reynaud, B. 2005. The void at the heart of rules: routines in the context of rule-following. The case of the Paris Metro Workshop. *Industrial and Corporate Change*, 14 (5):847-871.

Reinstaller A, Hölzl, W., Big causes and small events: QWERTY and the mechanization of office work, *Industrial and Corporate Change*, 18 (5): 999-1031.

Rerup, C., Feldman, M.S. 2011. Routines as a Source of Change in Organizational Schemata: The Role of Trial-And-Error Learning, *The Academy of Management Journal,* 54 (3):577-610.

Ring, P. S., van de Ven, A. 1992. Structuring cooperative relationships between organizations *Strategic Management Journal*, 13 (7): 483-498.

Robinson, S.E., K.J. Meier. 2006. Path dependence and organizational behavior: bureaucracy and social promotion, *The American Review of Public Administration,* 36 (3): 241-260.

Roth, A.V., Menor, L.J. 2003. Insights into service operations management: a research agenda. Production and Operations Management, 12: 145–164.

Rubalcaba L., Gallego, J., Hipp C., Gotsch, M. 2010. Organisational Innovation in Services, *Final report Europe INNOVA Sectoral Innovation Watch.*

Salvato, C., Rerup, C., 2011. Beyond Collective Entities: Multilevel Research on Organizational Routines and Capabilities, *Journal of Management*, 37 (2): 468-490.

Sampson S.E., Froehle, C.M. Foundations and Implications of a Proposed Unified Services Theory. *Production and Operations Management*, 15 (2):329-343.

Sasser, E., Olson, E.P., Wyckoff, D.D., *Management of Service Operations*, Allyn and Bacon, Boston, 1978.

Saviotti, P.P., Metcalfe, J.S. (1984), A theoretical approach to the construction of technological output indicators, *Research Policy*, 13, 141-151.

Schank, R. C., Abelson, R. P. 1977. *Scripts, plans, goals, and understanding.* Hillsdale, N.J.: Erlbaum.

Scheuing, E.E., & Johnson, E.M. 1989. A proposed model for new service development. *Journal of Services Marketing,* 3: 25-34.

Schmenner, RW. 1986. How can service businesses survive and prosper? *Sloan Management Review*, 27(3):21-32.

Schmitt, B. 1999. Experiential Marketing. *Journal of Marketing Management* 15 (1-3):53-67.

Schultze, U., & Orlikowski, W.J. 2004. A practice perspective on technology-mediated network relations: The use of internet-based self-serve technologies. Information Systems Research, 15: 87-106.

Schreyögg, G., & Sydow, J. 2011. Organizational path dependence: A process view. Organization Studies, 32(3): 321-335.

Schumpeter, J.A., 1934. *The theory of economic development: an inquiry into profits, capital, Credit, interest and the business cycle.* Cambridge, MA: Harvard University Press.

Senge P. M. 1990. *The Fifth Discipline: The Art and Practice of the Learning Organization.* New York: Doubleday Currency

Shostack, G. L. 1987. Service Positioning through Structural Change. *Journal of Marketing*, 51 (1):34-43.

Silvestro, R., Fitzgerald L., Johnston, R., Voss, C. 1992. Towards a Classification of Service Processes, *International Journal of Service Industry Management*, 3 (3):62-75.

Silvestro, R.1999. Positioning services along the volume-variety diagonal: The contingencies of service design, control and improvement, *International Journal of Operations & Production Management*, 19 (4):399-421.

Simon, H.A. 1945. *Administrative Behaviour.* New York: The Free Press.

Slappendel, C. 1996. Perspectives on innovation in organizations. *Organization Studies,* 17: 107-129.

Solomon, M. R., Suprenant, C., Czepiel, J. A., Evelyn G. G. 1985. A Role Theory Perspective on Dyadic Interactions: The Service Encounter, *Journal of Marketing*, 49 (Winter), 99-111.

Suddaby, R. 2006. What grounded theory is not. *Academy of Management Journal,* 49: 633–642.

Sundbo, J. 1996. The balancing of empowerment: A strategic resource based model of organizing innovation activities in service and low-tech firms. *Technovation,* 16: 397-409.

Sundbo, J. 1997. Management of innovation in services. *The Service Industries Journal,* 17: 432-455.

Sundbo, J. 2002.The Service Economy: Standardisation or Customisation? *The Service Industries Journal*, 22 (4):93-116.

Sydow, J., G. Schreyögg, J. Koch. 2009. Organizational path dependence: Opening the black box. *Academy of Management Review*. 34(4): 689–709.

Szulanski, G., Jensen, R. J. 2004. Overcoming stickiness: An empirical investigation of the role of the template in the replication of organizational routines. *Managerial and Decision Economics*, 25 (6-7):347–363.

Tansik, D.A., Smith, W.L. 1991. Dimensions of job scripting in services organizations. *International Journal of Service Industry Management*, 2 (1):35-49.

Teece, D. J., Pisano, G. Shuen, A. 1997. Dynamic Capabilities and Strategic Management. *Strategic Management Journal* 18(7): 509–33.

Tether, B. S., Tajar, A., The organisational-cooperation mode of innovation and its prominence amongst European service firms. *Research Policy*, 37 (4):720-739.

Thrane, S., Blaabjerg, S., Moller, R. H. 2010. Innovative path dependence: Making sense of product and service innovation in path dependent innovation processes. *Research Policy*. 39:932-944.

Toivonen, M., & Tuominen, T. 2009. Emergence of innovations in Services. *The Service Industries Journal,* 29: 887 - 902.

Tripsas, M., Gavetti, G. 2000. Capabilities, cognition, and inertia: Evidence from digital imaging. *Strategic Management J.ournal* (21): 1147–1161.

Tucker, A. L., & Edmondson, A. C. 2003. Why hospitals don't learn from failures: Organizational and psychological dynamics that inhibit system change. *California Management Review*, 45, 55–72.

Tushman, M. L., Anderson, P. 1986. Technological discontinuities and organizational environments. *Administrative Science Quarterly*, 31: 439-465.

Tushman, M., Rosenkopf, L. 1992. Organizational determinants of technological change: towards a sociology of technological evolution. *Research in Organizational Behavior*, 14:311-347.

Tyre, M. J., W. J. Orlikowski. 1994. Windows of opportunity: Temporal patterns of technological adaptation in organizations. *Organization Science*, 5: 98–118.

Vaasta, E., Walsham, G. 2005. Representations and actions: the transformation of work practices with IT use. *Information and Organization*,15 (1): 65-89.

Valorinta, M., Schildt, H., Lamberg, J. 2011. Path Dependence of Power Relations, Path-Breaking Change and Technological Adaptation. *Industry & Innovation*, 18 (8): 765-790

Van der Aa, W., & Elfring, T. 2002. Realizing innovation in services. *Scandinavian Journal of Management,* 18: 155-171.

van Driel, H, Dolfsma, W. 2009. Path dependence, initial conditions, and routines in organizations: The Toyota production system re-examined. *Journal of Organizational Change Management*, 22 (1), 49 – 72.

Van Looy, B., Gemmel, P., Desmet, S., Van Dierdonck, R., Serneels, S.1998. Dealing with productivity and quality indicators in a service environment: some field experiences, *International Journal of Service Industry Management*, 9 (4):359-376.

Van Maanen, J. 1979. The fact of fiction in organizational ethnography. *Administrative Science Quarterly,* 24:539-550.

Vargo, S.L., Lusch, R.F. 2004. The four service marketing myths – remnants of a goods-based, manufacturing model, *Journal of Service Reserch*, 6 (4): 324-35.

Vergne, J.P., Durand, R. 2010. The Missing Link Between the Theory and Empirics of Path Dependence: Conceptual Clarification, Testability Issue, and Methodological Implications. *Journal of Management Studies*. 47:736-759.

Vermeulen, P., van der Aa, W. Organizing innovation in services. In J. Tidd, F.M. Hull (eds.) *Service Innovation*. Imperial College Press, London, 2003.

Whitford, J., Zirpoli, F. 2011. The network firm as a political coalition: The reorganization, fall and rise of Fiat Auto. *Unpublished manuscript*.

Volkoff, O., Strong, D.M., Elmes, M.B. 2007. Technological embeddedness and organizational change. *Organization Science*, 18 (5): 832–848.
Voss, C., Hsuan, J. 2009. Service architecture and modularity. *Decision Sciences*, 40 (3):541–569.

Wand, Y., Weber, R. 1995. On the Deep Structure of Information Systems, *Information Systems Journal* 5(3): 203-223.

Weber, L., & Mayer, K.J. 2011. Designing effective contracts: exploring the influence of framing and expectations. *Academy of Management Review,* 36: 53-75.

Weick, K. E. 2001. Enactment processes in organizations. In K. E. Weick (Ed.), *Making sense of the organization*: 179–206. Malden, MA: Blackwell.

Wemmerlov, U. 1990. A taxonomy for service processes and its implications for systems design, *International Journal of Services Industry Management* ,1 (3):13-27.

Windrum, P., & Garçia-Goñi, M. 2008. A neo-Schumpeterian model of health services innovation. *Research Policy,* vol. 37: 649–672.

Winter, S.G. Szulanski, G. 2001. Replication as Strategy, *Organization Science*, 12 (6):730-743.

Winterton, J., Delamare Le-Deist, F., Stringfellow, E. 2005. Typology of knowledge, skills and competences: clarification of the concept and prototype (Thessaloniki, Cedefop).

Yin, R. K. 1994. *Case study research. Design and methods,* 2nd ed. Thousand Oaks: Sage Publications.

Zeithaml, V.A., Bitner, M.J. 1996. *Services Marketing*. McGraw-Hill, New York, NY.

Zeithaml, V., Bitner, M.J. 2000. Services Marketing: Integrating Customer-Focus Across the Firm, McGraw-Hill, New York, NY.

Zollo, M., J. Reuer, H. Singh. 2002. Interorganizational routines and performance in strategic alliances. *Organization Science*, 13:701–713.

Zomerdijk, L.G., de Vries, J. 2007. Structuring front office and back office work in service delivery systems: An empirical study of three design decisions, *International Journal of Operations & Production Management*, 27 (1):108 -131.

Zomerdijk, L. G., Voss, C. A. 2011. NSD Processes and Practices in Experiential Services. *Journal of Product Innovation Management*, 28 (1): 63–80.

Zucker, L.G. 1987. Institutional Theories of Organization. *Annual Review of Sociology*, 13:443-464.