



Service regime and innovation clusters: An empirical study from service firms in Taiwan



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ARTICLE INFO

Article history:

Received 18 July 2014

Received in revised form 30 May 2016

Accepted 12 June 2016

Available online 21 June 2016

Keywords:

Service regime

Patterns of innovation

Innovation clusters

ABSTRACT

The paper extends a notion of service regime framework as a synthesis approach to understand the diversity of innovation patterns in service firms. The service regime framework consists of three dimensions: innovation trajectories, appropriability, and user involvement. A dataset of leading top 311 Taiwanese service firms is collected through the postal questionnaire survey. The results reveal three newly stylized patterns of innovation in service firms: coupling innovation trajectories, joint use of formal and informal appropriability, and intimate user involvement. Moreover, four clusters following the firm-specific assumption to characterize heterogeneous compositions of the service regime are identified. The paper concludes that the service regime framework plays a major role in distinguishing specific service innovation clusters among firms and sectors. Finally, some policy implications for promoting service innovations are provided.

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1. Introduction

Although most economies are increasingly service-based (Sawhney et al., 2004; Tidd and Hull, 2003), there is little understanding of how service firms innovate (Drejer, 2004; Hipp and Grupp, 2005) especially when the boundaries between manufacturing and service industries become blurred (Chang and Yen, 2012; Metcalfe, 2006; Miles and Boden, 2000). Patterns of innovation provide an explanation to organize and understand the diversity of innovation patterns in firms and sectors (Pavitt, 1984). Previous studies on patterns of innovation have generally focused on manufacturing firms (Archibugi et al., 1991; De Marchi et al., 1996; Malerba and Orsenigo, 1997; Pavitt, 1984). These all emphasize that the sector differences as a rationale in understanding technological change (Archibugi et al., 1991; Malerba and Orsenigo, 1996), and suggest technological factors as critical roles determine specific patterns of innovative activities (Dosi, 1982; Pavitt, 1984, 1998).

Studies on patterns of innovation in services are relatively new and have been categorized into three approaches: assimilation (manufacturing-focused) (Evangelista, 2000; Miozzo and Soete, 2001; van de Poel, 2003), demarcation (service-focused) (Sundbo, 1997; Vargo and Lusch, 2004), and synthesis (technology-

service convergence) (Chang and Yen, 2012; Coombs and Miles, 2000; Gallouj, 2002; Gallouj and Windrum, 2009). These three have distinct practices to define and measure patterns of innovation in services. However, prior studies of patterns of innovation in services have been divergent due to heterogeneous approaches applied. A synthesis approach has pointed to a whole view of service innovations and provides the need of drawing for boundaries blurred between manufacturing and services (Drejer, 2004). Gallouj and Weinstein (1997) argued that studying patterns of innovation in services requires an explicit synthesis measure enlarging assimilation and demarcation approaches. Therefore, the paper has considered an extension of a service regime framework (Chang et al., 2012) to analyze patterns of innovation in services, but the difference is that the current study takes into account of user involvement and designs new measures to empirically examine Taiwanese leading top service firms. We consider three dimensions of the service regime framework as follows: innovation trajectories, appropriability, and user involvement.

This study contributes to theoretical implications by using the service regime framework as a synthesis approach, combining the assimilation and demarcation views to understand diversity patterns of innovation in services. Following the service regime framework analysis, the study reveals that three stylized patterns determine service firms' innovation behaviors of which advance understanding of how they accumulate innovations, protect intellectual property and interact with users for developing their owned

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specific characteristics. Importantly, the study contributes the extent to which the firm-specific assumption is treated of services, implying that service firms' innovations and heterogeneities differ across sectors and within a sector that have varied patterns of knowledge accumulation and development strategies in response to their idiosyncratic circumstance. This result challenges the traditional view of sector specificity that innovation firms within the same sector can be treated as homogeneous. Lastly, the study explores the four service innovation clusters characterized by heterogeneous compositions of the service regime framework that illuminate different patterns in terms of coupling innovation trajectories, joint use of appropriability and intimate user involvement.

The structure of the paper is organized as follows. The paper begins with a theoretical building for the stylized features of the service regime framework in Section 2. Research methods include data collection, measures, and data analysis in Section 3. Empirical research results are shown in Section 4. The discussion between the results and literature are offered in Section 5. Finally, conclusions, policy and managerial implications are provided in Section 6.

2. Service regime and patterns of innovation in services

2.1. Service regime as the synthesis approach in service innovation

A innovation taxonomy describes the behavior of innovating firms that are labeled in groups to predict their actions and suggests a framework for policy implications (Archibugi, 2001). It offers a comprehensive way to organize and understand the diversity of patterns of innovation for firms and sectors (Pavitt, 1984). As a theoretical precedent of the innovation taxonomy, it developed from a concept of technological regime (Dosi, 1982; Nelson and Winter, 1977). The technological regime considers how a firm's behavior is shaped by the nature of technologies it uses (Dosi, 1982), and constrains what a firm can and cannot do (Pavitt, 1998), and sets specific boundaries for a firm which achieves in the nature of trajectories (Nelson and Winter, 1977). The technological regime consists of four dimensions (Dosi, 1988; Malerba and Orsenigo, 1993): (1) opportunity conditions, (2) cumulativity of technological knowledge, (3) appropriability conditions, and (4) nature of knowledge base. Pavitt (1984) proposed a taxonomy based on the technological regime and characterized innovative characteristics and Schumpeterian behaviors in the manufacturing sectors. Four groups of firms were identified: (1) supplier-dominated, (2) scale intensive, (3) specialized suppliers, and (4) science based. However, using Pavitt's study as a base, others have classified patterns of innovation that consider service firms and industries (Castellacci, 2008; de Jong and Marsili, 2006; Evangelista, 2000; Miozzo and Soete, 2001; Peneder, 2010; van de Poel, 2003).

Prior studies for patterns of innovation in services by using technological regime view are inconsistent due to an assimilation approach adoption that limits drawing of the boundaries blurred between manufacturing and service industries. Three limitations are mainly emphasized. Firstly, innovation trajectories applied in services are restricted. Service firms not only focus on technological imperative but also take non-technological innovation modes into account (Chesbrough and Rosenbloom, 2002; Damanpour et al., 1989; Etlie and Reza, 1992; Gallouj, 2002) such as organizational and business model innovations. Secondly, utilization of informal appropriability in services is understudied (Andersen et al., 2003; Bader, 2008; Miles et al., 2000). Service firms frequently adopt informal appropriate methods for innovation protection (e.g., lead time and complexity design) than formal ones (e.g., patent and copyright) (Amara et al., 2008; Chang et al., 2012). Thirdly, producer-user co-production for innovation is fully overlooked.

Involving user into service innovations results in contributing new opportunities and making innovations socialized (Alam, 2002; Bendapudi and Leone, 2003; Bettencourt et al., 2002; Linton, 2009).

In summary, the current study extends the service regime framework as the synthesis approach to analyze patterns of innovation in service firms. These patterns as groups of firms assume homogeneous entities with respect to the similar innovative behaviors and reflect heterogeneity of industries with respect to the innovative activities pursued by its firms (Gallouj, 2002; Hollenstein, 2003). The service regime takes advantages of governance for both aspects—assimilation and demarcation. Specifically, the assimilation uses a technological perspective to analyze patterns of innovation in service firms (e.g., focus on technological regime, technological trajectories, formal appropriability and responsive user involvement), while the demarcation suggests innovation in services differs from manufacturing with consideration of service-focused theories, non-technological trajectories, informal appropriability and proactive user involvement (Coombs and Miles, 2000; Gallouj and Savona, 2009). Hence, the extension features of the synthesis in the paper are summarized in Table 1. Three stylized features are identified as coupling innovation trajectories (PBMC and POC), joint use of appropriability (formal and informal) and intimate user involvement (responsive and proactive). Each of three features is considered now.

2.2. Coupling innovation trajectories

Trajectories represent the movement along a specific path that is based on the past accumulation of knowledge, competence, capabilities and strategies (Dosi, 1982; Malerba and Orsenigo, 1993, 1997; Nelson and Winter, 1977, 1982). Innovation trajectories often apply to development of entire industries and firms (Andersen, 1998; Archibugi et al., 1991; Pavitt, 1984). The best known innovation trajectories distinction between product and process innovations are identified (Abernathy and Utterback, 1978; Barras, 1986, 1990; Utterback and Abernathy, 1975). Another widely recognized innovation types between technological and administrative (organizational) innovations are provided (Birkinshaw et al., 2008; Lam, 2005). Edquist et al. (2001) juxtaposed these two established innovation trajectories that distinguish between two types of product innovations including goods and services, and two types of process innovations such as technological and organizational. New types of product and process innovations have brought opportunities for organizational and business model innovations (Amit and Zott, 2001; Baden-Fuller and Haefliger, 2013; Camison and Villar-Lopez, 2014). From a Schumpeterian synthesis (Drejer, 2004), ad hoc, business model (external linking relationship), formalization, and market innovations (expertise-field) are strongly emphasized. Following the studies from Chang et al. (2012); Drejer (2004); OECD (2005), four typical types of innovation trajectories are applicable to be considered: product, process, organizational and business model innovations.

Many scholars have widely acknowledged there are strong complementarities between different types of innovation in the trajectories literature (Freeman and Soete, 1997; Utterback, 1996). For example, a radical innovation emerged often involves dynamic changes in products and production process as well as changes to the marketing strategy, delivery methods and service activities. However, recent stream on trajectories literature focus on the extent of complementarities that provides a better understanding of relational phenomenon with different types of innovation (complementarities-in-use) (Brynjolfsson and Milgrom, 2013; Ennen and Richter, 2010; Reichstein and Salter, 2006) and how these different forms create synergic performance better than stand-alone one single innovation type (complementarities-in-performance) (Amara et al., 2009; Evangelista and Vezzani, 2010;

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