DETERMINANTS OF LOGISTICS SECTOR INNOVATION: CREATING COMMON VALUE NODES IN SUPPLY CHAIN

LOJİSTİK SEKTÖRÜNDE İNOVASYON BELİRLEYİCİLERİ: TEDARİK ZİNCİRİNDE ORTAK DEĞER YARATMA

Assoc. Prof. Dr. Serhat Burmaoğlu
İzmir Kâtip Çelebi University
serhat.burmaoglu@ikc.edu.tr

Assoc. Prof. Dr. Yiğit Kazançoğlu
İzmir University of Economics,
yigit.kazancoglu@ieu.edu.tr

Assoc. Prof. Dr. Harun Şeşen
European University of Lefke
hsesen@eul.edu.tr

Received 5 October 2015 – Accepted 11 November 2015
Gönderim 5 Ekim 2015 – Kabul 11 Kasım 2015

Abstract: Innovation has been emerging as a topic of importance over 50 years. Studies have mainly concentrated on manufacturing sector and investigated the determinants and facilitators for increasing innovation performance of manufacturing firms. The service sector is also an important component for strong economies. This study aims to demonstrate the innovation profile of transportation firms according to the four innovation categories using the 2008 Innovation Survey conducted by Turkish Statistical Institute. In the analysis section, a logit model is performed and determinants of innovation are found by using selected variables. The final section gives some implications to help logistics firms enhance their innovation performance.

Keywords: service innovation, logistics, logistics innovation, innovation, value chain, logit analysis

Öz: Yenilik son 50 yıldır önemli bir konu olarak ortaya çıkmaktadır. Çalışmalar ağırlıklı olarak imalat sektöründe yoğunlaşmış ve imalat firmalarının inovasyon performansını artırmak için gereken belirleyicileri ve kolaylaştırıcıları araştırmıştır. Hizmet sektörü de güçlü ekonomiler için önemli bir bileşendir. Bu çalışma Türk İstatistik Enstitüsü tarafından yapılan 2008 yılı Yenilik Anketi sonuçlarını kullanarak dört inovasyon kategorisinde ulaştırma sektörü firmalarının yenilik profillerini ortaya koymayı amaçlamaktadır. Analiz bölümünde, bir logit modeli yapılmış ve seçilen değişkenler bağlamında inovasyon belirleyicileri incelenmiştir. Son bölümde lojistik firmalarının inovasyon performansını artırmaya yardımcı olmak üzere bazı öneriler getirilmiştir.

Anahtar Kelimeler: hizmet inovasyonu, lojistik, lojistik sektörü inovasyonu, inovasyon, değer zinciri, logit analizi

1. INTRODUCTION

From a technological point of view, service innovation is usually considered as activities that complement production processes. Initially, services were treated with a conservative approach that provided no significant contribution to the sector, the intra dynamics of the firm or competition strategies (Cainelli *et al*., 2004). However, the increase in the need for services in communities and the "servicisation" of the public has caused researchers to address the issue of innovation in the services sector (Toivonen & Tuominen, 2009

With the significant progress of the service sector throughout the world (Akehurst, 2008), the identification of the determinants of it has become critical. Vence and Trigo (2009) state that innovation is considered as an issue associated with research & development and number of patents, and that only the analyses of these variables are considered as significant. Since determinant studies regarding innovation in the production sector have been widely carried out, there were attempts to attribute the same variables to innovation assessment in the service sector. However, through the studies of various researchers over the last decade, the importance and difference of the innovation activities in the service sector have been emphasized, which has brought about the need for a change in approach. It has been observed that service innovation consists of processes, which need to be addressed separately from innovation in the production sector. Thus, it has been indicated through several empirical studies in the literature that innovation activities applied in the service sector are different from those applied in the production sector. While some of these studies emphasize that this difference is very limited, even that the two sectors are similar (Arvanitis, 2008), others have asserted that the differences stem from the way the innovation transpires (Barras, 1986; Aas & Pedersen, 2010).

The differentiation of the innovative behavior between the production and services sectors has rendered conducting determinant studies in these areas critical. It is significant that while determinant studies are frequently conducted in the production sector, corresponding studies in the service sector are almost non-existent. In this context, the primary aim of this study is to analyze the firms in the transportation sector, an important sub-sector of the service industry, according to the four types of innovation outlined in the OECD (The Organisation for Economic Co-operation and Development) Oslo Handbook, and to develop strategies on the issues on which these firms need to focus in order to acquire a more innovative structure. The secondary aim of the study is, in light of the acquired data, to identify the issues that require the creation of cooperation potential with the other firms that are part of the supply-chain, and to explore ways to form common value nodes. Considering the limited amount of research in this area and the impact of the transportation sector on national economy, this study is expected to provide a significant contribution.

There is also an important reason why the logistics sector has been included in the study. Logistics is a sector that is actually integrated with the production sector. Therefore, when the supply-chain philosophy and value-chain approach are considered, it will be possible to align the determinants that are to be identified in the logistics sector with those in the production sector. With this aspect, this study embodies a significance that will contribute to the development of common innovation strategies for the firms inside the supply chain and to the maximization of the synergetic effect inside the value-chain.

As in the rest of the world, in Turkey, the services sector also has a significant share. According to Turkish Statistical Institute (TurkStat) data for 2009, the services sector constitutes 63.5% of GDP (Gross Domestic Product) in Turkey.

Among these services, transportation sector constitutes a share of 21.03%. Also for TurkStat data in 2009, the number of employees in the transportation sector increased by 473,000 in the last thirty-year-period. Upon analysis of the data, it has been observed that in Turkey, the logistics sector constitutes a significant share of the service sector. In this context, developing strategies for transportation firms to take actions to enhance their innovative skills becomes critical also in terms of total value that is to be created.

In light of the established general framework, the study has been structured as follows: In the second section, the service sector and the literature on the service sector has been analyzed, and the importance of innovation in the service sector has been considered. In the third section, the limited literature on logistics innovation, with the contribution of the studies conducted in the literature, has been scrutinized with an emphasis on importance of logistics innovation in the service sector. The data and the variables used in the process, the stages of the analysis and the findings have been presented in the fourth section. Finally, in the fifth and last section, some strategies that will enhance the innovation development of the logistics sector are put forward, in light of the acquired data.

2. SERVICE INNOVATION

If, before moving on to service innovation, we wish to define innovation from a more general point of view, the following definition provided by OECD in the Oslo Handbook should suffice: "Innovation is the application of a new or significantly altered product (goods or services), a new process or a method; or the implementation of a new organizational method in business practices, workplace organization or external affairs." (OECD, 2005)

Through the examination of this definition, it is observed that innovation has been expressed with a very general point of view. By reason of this general approach, researchers proposed a vast amount of innovation types in literature (see Rowley *et al*., 2011). However, a sector-centered point of view may lead to a different consideration of the expressions mentioned in this definition. For example, the concept of 'product' may lead to different perceptions for production firms and service firms. That is to say, an issue perceived as product by a service firm may be perceived as a process by a production firm. Because of this paradox, several studies have been conducted in the literature in order to define service innovation.

Sundbo and Gallouj (1999) define innovation in the service sector as incremental innovation, in which small adjustments are made on processes, and argue that it is not usually possible to have radical innovations in this context. Van Ark *et al*., (2003), on the other hand, view service innovation as a multidimensional process, and assert that, when compared to production innovation, the organizational facet of service innovation outweighs that of product innovation. Even though different definitions exist, it can be said that technology is an important factor in service innovation and, especially in certain subsectors, the applications are shaped by technology.

On the other hand, firm-level innovations are generally categorized as product and process innovations. However, it is also seen that there exists an insufficiency in defining innovation regarding services through this traditional approach. According to Den Hertog (2000), there are four dimensions of service innovation: (1) The concept of new services, (2) new client interface, (3) new distribution system for services, and (4) new technology. It is really hard to differentiate product innovation and process innovation, especially considering that, in services sector, "product" is generally perceived as "process" (Camacho & Rodriguez, 2008).

In short, it can be said that service innovation includes several multifaceted concepts in observing the existence of a new service (Aas & Pedersen, 2010).

In addition to the difficulty providing a definition for innovation in the service sector, another complex issue is how innovation in this sector emerged. It is believed that the most important study conducted on this issue is that of Coombs and Miles (2000), who mention three different approaches in the implementation of innovation in the service sector, the assimilation approach, the demarcation approach and the synthesis approach. The assimilation approach, through a traditional way, emphasizes the similarities between the innovation processes in the production sector and the innovation in the services sector. The demarcation approach focuses on organizational innovation and the innovation of services at databased operations (Salter & Tether, 2006). The synthesis approach strongly suggests that certain facets of the innovation process are neglected (Coombs & Miles, 2000). Chamberlin *et al*. (2010) mention two popular approaches: (1) supply-dominated approach and (2) the approach named as The School of Lille, focused on the interactive nature of innovation.

Barras (1986) asserts that service innovation follows a route that is the exact opposite of the innovation processes implemented in production activities, and defines it through a reverse product cycle consisting of three stages.

Upon comparison of innovation in the service sector to that in production firms, it has been observed that firms that provide services tend to focus more on organizational innovation, whereas production firms choose to work on product and process innovation (Tether, 2005). Similarly, in the study conducted in Spain, Castro et al. (2011) have compared the technological, organizational and commercial innovation behaviors of service and production firms with each other. They have also found in their study that production firms have a tendency to go for technological innovation (product / process innovations) whereas service firms tend to focus on organizational and commercial innovation. Arvanitis (2008) has also taken part in these comparisons using Sweden CIS-2 data; however, he has reported to have achieved similar data to the study they have conducted in the production industry in 1994.

Aas and Pedersen (2010) have approached the comparison in terms of financial influence and conducted their analysis using the 2006 Norway CIS data, observing that service innovation is influential on financial performance and that focusing on service innovation enhances productivity in both production and service firms.

When all studies are analyzed, it has been found that no single study aims to specify the determinants of service innovation; rather, they all have the aim of determining the differences between performing innovation in the production sector and in the service sector. It has also been observed that several studies have made this difference clear. Even though differences between innovations in the production sector and the service sector are the main focus of these studies, when the impact of innovation on economy is considered, it has been asserted that, instead of the differences between the sectors, it is the specification of the similarities which is important for the integration of the two sectors. As a result of the conducted studies, it can be seen that, when the ultimate goal is to create an innovation economy, the critical issues are the specification of value-making applications in each sector, and putting forward the variables that will facilitate innovation. In contrast, deepening the differentiation and depicting the sectors in the same economy as different from each other may cause the synergetic effect to diminish. The critical reason for selecting the transportation factor is the fact that firms inside the supply-chain embody both the production and the service sectors, thus in this sector, there is greater opportunity to identify the actions to be taken to increase synergy.

Classification studies have begun with the study conducted by Pavitt (1984), who viewed the service sector as supplier-dominated in the taxonomy of technological activities. Soete and Miozzo (2001) classified the service sector in terms of innovation, appraising the service sector in to four main groups. According to this, the first group is the supplier-dominated group, which includes especially the public service sector. The second group is the Scale Intensive Physical Networks group, consisting of transportation firms, most of which develop product innovations and allocate extensive funds for the purchase of machinery and equipment. The third group, described as the Scale Intensive Information Networks group, includes institutions such as financial institutions, software firms and R&D firms. The last group is called the Science-Centered Group, which constitutes the biggest group of the service sector and has the biggest share in spreading the innovation. Using the Spain Innovation Survey data, Camacho and Rodriguez (2008) have approved the classification provided by Soete and Miozzo (1989) in terms of innovation patterns. A similar grouping study has been conducted by Hollenstein (2003), which achieved a five-group classification.

Formulating and generalizing the service sector in terms of innovation patterns on the basis of sub-sectors is a challenging issue. However, this study focuses on transportation activities, the transportation sector have been included by various classification studies in the following groups: Scale Intensive Information Networks (Soete & Miozzo 1989, Camacho & Rodriguez, 2008), supplier-dominated (den Hertog & Bilderbeek, 1999), technology users (Evangelista, 2000) and market-oriented incremental innovators with external links (Hollenstein, 2003). It has also been found significant that, while the transportation sector has been found close to technology, and classified as such, there has not been a sufficient amount of studies conducted in this area.

Another result of the differentiation within the service sector is the need for sector-based studies. Through greater focus by academicians on this area, and more sector-based studies, generalizations can be made on innovation patterns, leading to more realistic suggestions for strategic approaches. A significant differentiating facet of the transportation sector within the general service sector is the fact that, in the supply-chain approach, this service is viewed as a value-enhancing application. Therefore, the development of the innovative structure of the transportation sector constitutes a critical link within the value-chain.

3. LOGISTICS SECTOR INNOVATION OVERVIEW

The Logistics Management Council defines logistics management as "… is that part of Supply Chain Management that plans, implements, and controls the efficient, effective forward and reverse flows and storage of goods, and related information between point of origin and the point of consumption in order to meet customer requirement". When the definition is analyzed, it is observed that there exists a customer-oriented approach during the flow of goods and that an effective and efficient control process where the structure of the supply-chain is considered holistically is emphasized. This emphasis, as asserted in the research conducted by Mentzer et al (2004), is also significant in the context of behavioral theories and work strategies of firms in the historical process. According to this, while in the beginning, the aim was the maximization of profit for the firms, changing conditions have pushed firms toward information and learning based approaches (Vasconcellos et al., 2011). In this general frame of view, Mentzer et al (2004) have appraised the logistics sector as technology oriented.

Especially in the time that includes the last part of the 19th century and a large part of the 20th century, the efficiency and productivity of the supply-chain started to become increasingly important. Within the context of the supply-chain philosophy, production firms have been making efforts to increase customer satisfaction, especially through redesigning distribution processes (Potts & Mandeville, 2007). Due to the structures that cause, via supply-chain approaches, to take competition out of the hands of the firm and have an impact on all the firms in the chain, the fact that innovation is performed by all firms in their own fields will bring an important value to the chain. Doing this contribution mutually may significantly increase the potency of the effect (Goktan & Miles, 2011).

Along with the fact that the production sector has put forward the value-chain approach by motivating other firms, included in the chain while conducting innovations in their own processes and products, the issue of innovation in the logistics sector has also started to be deemed important. The globalization of the economy and the increase in competitive pressure has brought about attempts in many firms to reshape cost and service advantages by constantly improving logistics performance (Zhao & Wang, 2010). With the supply-chain approach, logistics industry constitutes the center of economic, social and environmental sustainability (Mena et al., 2007). Thus, logistics has begun to be viewed as a significant tool for differentiation in competition, and this has resulted in the development of increased competition among logistics firms, which, in turn, has led these firms to obtain significant changes through the supply of innovative logistics products for customers (Mentzer *et al*., 2004). In short, logistics has begun to be used as a weapon of competition, in terms of supply-chain management, for achieving customer satisfaction and distribution optimization.

Logistics innovation at individual firms is a very important mechanism in the development the logistics industry. The nature of logistics innovation embodies two facets; technology and service innovation (Zhang *et al*., 2008). In the logistics sector, where competitive edge and firm development is critical, it is believed that the issue of innovation has not been paid enough attention by researchers. Wagner (2008) has analyzed the studies conducted in the logistics field over a forty-year-period up to 2008, observing that only six articles had been written on the topic of innovation in logistics, logistic services and the transportation industry. Also, in a study that would support the findings of Wagner (2008), the literature analysis conducted by Grawe (2009) also mentions the insufficiency of innovation research in the logistics sector. It can therefore be said that this study will make contribution in filling the gap apparent in this respect.

When the issue that is approached this way in terms of the perspective of business strategy is viewed in the context of competitive strategies, it is observed that in the 1980s, logistics management regarded “time” as the competitive edge (Stalk *et al*., 1992) while in the 1990s, it was logistics customer services (Manrodt et al., 1997; Morash *et al*., 1996) that began to be deemed important in creating value for the customers. Upon reaching 2000s, the importance of logistic capabilities has begun to be recognized in contributing to the firm’s competitiveness in creating economic and market-based value (Mentzer *et al*., 2004).

Another important issue achieving a competitive edge is to ensure its sustainability. It has been asserted by Olavarrieta and Ellinger (1997) that, in terms of the sustainability of competitiveness, logistics embody a differentiating quality and that it should be viewed as a strategically significant resource. The reason for viewing this value strategically in terms of logistics is firms’ desire to embody fast response systems and that they regard effective customer response initiatives as important for immediate supply programs. Therefore, for these firms, logistics is considered as a basic skill.

The strategic importance of logistics also increases the significance of innovation and information in the logistics sector. Flint *et al*. (2005) have defined logistics innovation as follows: "Logistics innovation refers to any logistics-related service that is seen as new and helpful to a particular focal audience". While similar definitions are given by various authors, these definitions tend to emphasize either the quality of being customer oriented (Arroniz *et al*., 2005; Bolton *et al*., 2007) or market oriented (Chapman *et al*., 2003). It is emphasized by Chapman et al. (2003) that logistics service innovation has a significant impact on providing services to the market. The innovation of logistics services may facilitate in developing strong relationships with customers, creating disincentives for competition, enhancing customer loyalty, adjusting costs and executing market activities more efficiently (Bolton *et al*., 2007).

(1) Antecedents of the Logistics Sector Innovation

It has been asserted in Grawe's (2009) analysis of the literature that while the benefits of innovation for logistics firms are generalized in this regard, there have not been a sufficient number of studies conducted in order to clarify the factors motivating logistics firms to engage in innovative activities.

Soosay and Hyland (2004) while specifying logistics innovation premises, mention internal and external motives, which are classified as either push or pull factors.

One of the most important inputs for innovation is information and the information generation. Information, when viewed as a resource, might facilitate in creating competitive edge (Mentzer *et al*., 2004) and sustainable competition strategy can only be maintained through the information owned by the firm (Tidd *et al*., 2001: 23). Potts and Mandeville (2007) suggest that services enhanced via information and communication technologies are the most important incentive of modern economic development. The authors also believe that information is the basic dynamic of the service sector. The geographically disorganized structure of logistics firms (Andersson & Norman, 2002) signifies information sharing and coordination among intra-organizational elements. Chapman et al. (2003) mention the positive effect of developing new ideas by utilizing intra-organizational information and inter-organizational relations while emphasizing the significance of information in logistics innovation. Similarly, Autry and Griffis (2008) have also contributed conceptually to the positive relationship between information and logistics innovation. Mentzer *et al*. (2004) mention that especially the development of intra-organizational information sources inside the firm, since it carries a unique quality for the firm, may be considered as a competitive weapon. Soosay and Hyland (2004) emphasize that information gathered from customers, rivals or the executed processes will be extremely beneficial in developing organizational functions innovatively and meeting customer demands or in competing with the rivals. Hakansson and Persson (2004) and Panayides and So (2005), who approach the issue from the point of view of organizational learning, indicated that innovation can be achieved through information and new ideas. While benefiting from external resources, Schiavone (2011) proposes that hiring external consultants is advisable beyond normal knowledge managing practices used by organization and finds that wide and multi-dimensional approach is compulsory for managers in order to understand and effectively respond to technological competition. Considering these studies, the following hypotheses have been developed:

Hypothesis 1: Employing in-house information sources efficiently has a positive effect on innovation.

Hypothesis 2: Being open to external information sources has a positive effect on innovation.

Another leading factor for innovation is R&D activities. R&D is not cared much in the innovation activities carried out in the service sector; however, Wagner (2008) envisages that intramural and extramural R&D should be dealt as the key activities for logistics innovation in transportation industry. While Lin (2006) states that 35% of logistic firms have R&D departments, Wagner (2008) found that logistic firms put few resources into such activities. Sossay and Hyland (2004) and Tourigny and Le (2004) state that financial reasons can be both a leading factor for applying innovation, but also an obstacle to innovation in firms. Ho *et al.* (2011) state an analogy that companies must balance design capabilities and manufacturing capabilities. So this makes different R&D usage approaches for sectors as well. As a result, in order to test this, the following hypotheses have been developed to examine the effects of intramural and extramural R&D expenses on innovation:

Hypothesis 3: Intramural R&D expenses have a positive effect on innovation.

Hypothesis 4: Extramural R&D expenses have a positive effect on innovation.

It is known that innovation is also associated with building strong relations among companies and developing networks. Hakansson and Persson (2004) found that cooperation has a significant effect on innovation and this cooperation can be deemed as opening the door beyond the borders of a single firm (Cambra-Fierro *et al*., 2011). Chapman et al. (2003) also mention that developing relational networks has a guiding effect on logistics service innovations. Moreover, as for cooperation with a competitive perspective, Mentzer *et al*. (2004) believe that cooperation between in-house functions, and also with other companies in the supply chain is important in gaining an advantage for competition. Limits in the time loop are considered to strengthen cooperative behavior for logistic firms and it is stated that firms can therefore lower their innovation costs (Busse, 2010; Busse & Wallenburg, 2011). In addition, Soosay *et al*. (2008) revealed that in order to assure an advantage for competition and success in business the importance of inter organizational relations has increased. Sommer and Haug (2011) approach the issue in the view of International Entrepreneurship and find that executives' experience and knowledge is an important part of international collaboration as well. In accordance with these views following hypothesis has been developed regarding network development and cooperation activities:

Hypothesis 5: Cooperation through developing networks has a positive effect on innovation.

One of the important sources of information generation is financial sufficiency. While financial sufficiency can be considered to be the firm's endorsement, it can also benefit from financial support from outside sources. The effect of financial sources was studied by Richey *et al*., (2005) in terms of reverse logistic innovation. Sauvage (2003) stated that logistic firms tend to possess inadequate financial sources to create innovative solutions, and therefore he found that technological effort was mainly made by larger companies. Although it is seen in the literature that logistics innovation is dealt with the aspect of financial support and the aspect of endorsement, which is the economic power of firms, considering this is also important, this aspect has been included into the hypotheses as well. As Sauvage (2003) also stated, a firm's endorsement can also be considered as its financial power. Therefore, following hypotheses have been agreed to be included:

Hypothesis 6: Benefiting from financial support has a positive effect on innovation.

Hypothesis 7: Having high endorsement affects has a positive effect on innovation.

Service sector firms invest heavily in human capital and pay close attention to staff quality and quantity. The number of employees changes, especially according to the market size. The issue of innovation requires, above the all production of ideas, and therefore it can be asserted that a rise in the number of employees is likely to create a positive effect. Although no studies have been found in the literature regarding the relation between the number of employees and the amount of innovation in the logistics sector, it is considered to be a point that needs attention. It can also be expressed that, in parallel with the number of employees, market size is also a factor which encourages innovations. This is due to the fact that because of the nature of the logistics sector, expansion of a firm means growth in geographical scope. Correspondingly, expanding over a greater area may require the increases in the staff numbers, equipment and physical capacity to reach an optimal level. In this context, following hypotheses have been developed:

Hypothesis 8: The number of employees has a positive effect on innovation.

Hypothesis 9: Market size has a positive effect on innovation.

4. METHODOLOGY

As stated in the beginning, this study aimed to identify which variables are deterministic when Turkish firms conduct innovations in logistics. For this reason, four basic models have been used. The research model is shown in Figure 1.

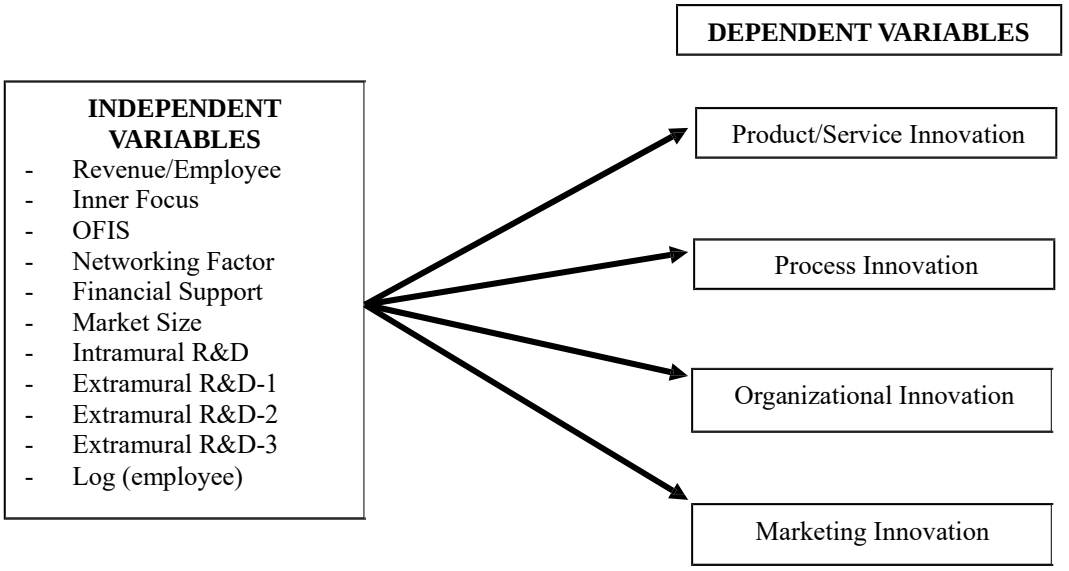

Figure 1: Research Model

Research models were dealt separately with binary logistic regression models and the effect of independent variables on dependent variables was examined. The aim was to seek independent variables that maximize the differentiation of transportation firms in relation to their dependent variables of making innovations or not in terms of all innovation types. All hypotheses stated in the beginning were tested with the help of the findings obtained for each innovation type.

4.1. Data

This study uses the data from the Innovation Survey of 2008 carried out by TurkStat, which covers the period between 2006 and 2008. Innovation surveys were first carried out for the years 1995-1997 in accordance with the standard Oslo methodology and European Community Innovation Survey-2 (CIS 2) employed by EUROSTAT. The Technological Innovations Survey for the period of 1998-2000, carried out in March 2002 following the launch of European Community Innovation Survey -3 (CIS 3), was created as a result of EUROSTAT methodology revisions. Technological Innovations Survey study for the years 2002-2004 was carried out in the year 2005 in accordance with European Community Innovation Survey-4 (CIS 4). Innovation survey covering the years 2006-2008 was applied according to CIS 5 and the results were published in 2009.

In this study data from 2008 Innovation Survey were used. As for sectors, data concerning the companies in the NACE 60-64 (NACE Ver.1.1) range are analyzed. The total number of companies in this classification is 751 with 453 are categorized as small scaled (10-49 employees), 187 as medium scaled (50-249 employees) and 111 as large scaled (250+ employees) companies. Frequencies of innovating companies (coded with "1") and non-innovating companies (coded with "0") according to their innovation types are given in Table 1.

Table 1: Innovation Types and Percentages

Innovation Types	*1*	*0*	*Percentage of Innovation*
Product/Service Innovation	111	640	14.75%
Process Innovation	124	627	16.51%
Organizational Innovation	91	660	12.12%
Marketing Innovation	82	669	10.92%

In Table 1, it is seen that despite not being very high in percentages, innovations of all types are performed in logistics sector.

4.2. Variables

The raw data acquired with 2008 Innovation Survey are compiled using mathematical transactions to make them suitable for the research model, and are included in the analysis by means of transformations. Great importance was attached to the fact that the variables used enable the hypothesis to be tested. The variables built are as follows:

4.2.1. Dependent Variable:

The variable(s) of the presence or absence of innovations was/were used as binary variables. Companies were asked whether they made product, process, organizational and marketing innovations between the years 2006 and 2008, and innovating companies were coded with "1" while non-innovating ones were coded with "0".

4.2.2. Independent Variables:

Openness for information sources-OFIS: Although the creation of information is considered to be a task which the firm can do on its own, benefiting from outside sources of information is an important facilitator in the production of information. Cooperation between companies in order to benefit from outside sources of information may be due to reasons such as lowering the cost of technological developments or facilitating penetration into the market, through utilizing scale economy in production and accelerating the development and commercialisation of new products (Tidd *et al*., 2001: 198). In addition, Van Riel *et al*. (2011)

imply that acquiring information plays a major role in dealing with uncertainty and may increase the probability of success of a selected new service proposal.

The variable of openness for information sources was built as the firm's level of benefiting from outside information sources in this study. In the innovation survey, information sources acquired from outside the firm consist of 3 main and 10 lower dimensions being market sources (5 lower dimensions such as machinery, equipment and software suppliers, clients, other enterprises and consultants in the same sector, commercial laboratories or private R&D corporations), institutional sources (2 lower dimensions such as universities and other institutions of higher education, and public research institutes) and other sources of information (3 lower dimensions such as conferences, commercial fairs, exhibitions, scientific journals, commercial/technical publications and foundations, chambers of profession and industry). For the information sources used by companies, numbers were added together by giving one point for each lower dimension and thus a new variable with a figure between 0 and 10 was obtained. Thus, a score of 10 represents a firm with a high utilization of outside sources of information while a score of 0 means one, which does not use outside sources at all.

Intra-institutional focus- IIF: The contribution of in-house information sources to innovation is considered to be lower than that of external sources; however, in many industries, a greater part of a firm's innovation efforts is made using the inner information sources (Nelson, 2000). This variable defines the level at which firms benefit from in-house information sources in the process of making product or service innovations. Firms' levels of use of in-house information sources and the answers were coded as high (3), medium (2), low (1) and not used (0). These values have been put together and a new variable has been formed, which contains the values changing between 0 and 3. In so doing, firms which not benefiting from inner information sources at all and those benefiting at a maximum level can be shown by a single variable.

Networking factor: As considered to be one of the innovation strategies of firms, cooperation is a variable, which was formed in order to study the relative importance of cooperation in terms of logistics sector. When the supply chain and long-term relationships with manufacturing firms considered, trust and networking (Bergh et al., 2011) can make significant contributions to knowledge generation and potential consequences for firms' exploiting opportunities and the need recognition of new product familiarity triggers the networking option as well (Cantarello et al., 2011). The variable of networking has been analysed on the basis of 5 different options, depending on whether the 7 parties or institutions cooperating with firms in the survey from Turkey, Europe, the USA, China or India. The responses of participant firms for their cooperation have been coded with 1, all values added up and a new variable was created including the values between 0 and 35. With this variable, firms which do not cooperate at all are shown with '0' point while firms cooperating at maximum levels with '35' points. Thus, it has been assessed that the firm with the highest cooperation has a maximum ability for networking as well.

R&D Expenses: In examining the innovative capacity of firms through R&D expenses, the following four variables have been used. These variables have been used by being recalculated according to the ratio of the amounts of money spent, to the number of employees as reported by the firms. Therefore, while the third hypothesis was tested by one variable with these variables, the forth hypothesis was tested by using three different variables. Assuming that the variables would all have a positive effect on innovation; R&D Service Expenses purchased externally by the enterprise were tested by H4a hypothesis, machinery- equipment and Software Supplies were tested by H4b hypothesis and Licence and Know-How Purchasing Expenses were tested by H4c hypothesis.

- Intra-organizational R&D expenses / Number of employees
- Expenses of R&D Services purchased externally by the enterprise / Number of employees
- Expenses for Machinery-Equipment and Software Procurement / Number of employees
- Expenses for Patent and Know-How Purchase / Number of employees

Endorsement variable (Income / Employee): As R&D variables, the endorsement variable has also been used by being proportioned to number of employees. Although this variable is considered an exogenous variable, it was decided to be used among the determiners as a result of the assessment that, in the analysis to be carried out, endorsement would be a stronger motivator in encouraging innovation in the firm.

Number of employees (Logemployee): Porter points out that the size of an organization is also of importance in choosing strategies; large-scale firms use broad front strategies, whereas small-scale firms prefer focused strategies (Tidd et al.2001: 79). From the knowledge retention point of view, Sitlington and Marshall (2011) didn't find any impact of downsizing decisions on knowledge retention, as well. The number of employees has been considered the control variable and used logarithmically. The number of employees has not been approached according to the small-medium and large-scale classification. However, it is still possible to examine the effect of the size of the organization on innovation.

Market diversity: Market diversity variable focuses on the number of markets used by firms and their diversity. In the construction of this variable, firms which participated in the survey were asked whether they sold their products or services in local/regional markets, Turkey-wide, in EU countries and others between 2006 and 2008. Each Market types reported by the firms were coded with 1, and all figures added up and a new market diversity variable constructed. The constructed variable takes a value of 1-4 with the value of 1 showing a single market access, and the value of 4 showing effectiveness in all market types. This way, both the firms' Market diversity and the size of the Market have been attempted to be measured using the newly constructed variable.

Financial support: Finally, the financial support variable allows analysis of whether the firms made use of financial support during the innovation process. The analysis determines whether the firms made financial use of central public authorities and Turkish Foundation for Development of Technology (TFDT), local or regional public authorities, EU institutions and EU Framework Programs. Affirmative answers were coded with 1 and negative answers with 0. Consequently, with the help of the acquired variable, firms that have utilized financial support from several sources were indicated by 4 and those that have not utilized any financial support, by 0.

5. RESULTS

Before the main analysis, analyses were conducted in order to overcome the problem of multi-collinearity and extreme values, and these values have been excluded. No problems of multi-collinearity were found (Tolerance>0.30, VIF<10). First, three models concerning product and service innovations were analyzed, and the results are given in Table 2.

Table 2: Results of Product and Service Innovation Models

Variables/Models	Product/Service Innovation		Product Innovation		Service Innovation	
	Coef.	***Odds Ratio***	***Coef.***	***Odds Ratio***	***Coef.***	***Odds Ratio***
_cons	-3.105 (***)		-4.439		-3.426	
Extramural R&D-3	2.62e-07	1			4.60e-07	1
Extramural R&D-2	1.16e-07	1	-2.80e-08	1	8.98e-08	1
Extramural R&D-1	-2.75e-06	0.999	9.11e-06	1 (*)	-7.88e-06	0.999 (*)
Intramural R&D	1.09e-06	1	-2.44e-06	0.999	1.02e-06	1.000
Market Variety	-0.218	0.804	0.011	1.011	-0.157	0.854
Networking Factor	0.0364	1.037	0.045	1.046	0.064	1.066
Financial Support	-0.225	0.799	-0.509	0.601	-0.245	0.782
IIF	0.955 (***)	2.599	1.634	5.126 (***)	0.881	2.413 (***)
OFIS	0.259 (***)	1.296	-0.040	0.961	0.225	1.252 (***)
Logemployee	0.069	1.072	-0.400	0.670(*)	0.123	1.130
Income/Employee	1.32e-09	1	-2.90e-08	1	-7.81e-10	1
Classification Success		89.84%		%97.74		%89.10
Area Under ROC Curve		0.9481		0.9528		0.9437
Model Fit Statistics		Pearson chi2(667) = 495.02 p>0.05 PseudoR^2= 0.4318 (p<0.05)		Pearson chi2(654) = 224.34 p>0.05 PseudoR^2=0.4057 (p<0.05)		Pearson chi2(667) = 491.55 p>0.05 PseudoR^2=0.3905 (p<0.05)

When Table 2 is examined, it can be seen that in the model, which studies product and service innovations, variables of openness for information sources and the degree of use of in-house information sources are statistically important. It can also be observed that the most important positive contribution is made by the in-house information usage variable.

As for product innovations, it can be stated that in addition to the use of in-house information sources, the number of employees and expenses for extramural R&D services of the enterprise are also statistically important. Here, despite being small, the number of employees has a negative effect. However, the variable of using in-house information sources appears as the most effective positive variable in the creation of product innovations.

In the analysis of service innovations, the variables of openness for information sources and the degree of using in-house information sources are positive and statistically important, whereas intramural R&D expenses have a statistically important negative effect. The fact that intramural R&D expenses have a negative effect is considered to have a remarkable consequent.

All models analyzed are statistically important. Furthermore, taking into consideration the success of classifications and comparing the areas falling under the ROC curve, it can be claimed that the product innovation model is the single most successful model. Upon testing the models concerning organizational and marketing innovations, the results in Table 3 have been reached.

Table 3: Results of Organizational and Marketing Innovation Models

Variables/Models	**Organizational Innovation**		**Marketing Innovation**	
	Coef.	***Odds Ratio***	***Coef.***	***Odds Ratio***
_cons	-3.851		-3.318	
Extramural R&D-3	-1.29e-06	0.999 (*)	9.85e-07	1
Extramural R&D-2	-1.65e-08	1	-9.88e-08	0.999
Extramural R&D-1	1.51e-06	1	-1.30e-06	0.999
Intramural R&D	-6.91e-10	1	4.33e-08	1
Market Variety	0.080	1.083	0.143	1.154
Networking Factor	0.306	1.358 (***)	0.151	1.163(*)
Financial Support	-0.365	0.694	0.648	1.912
IIF	0.734	2.084 (***)	0.335	1.398 (*)
OFIS	0.006	1.006	0.274	1.315 (***)
Logemployee	0.238	1.269 (***)	0.009	1.009
Income/Employee	-1.32e-07	0.999	2.06e-09	1
Classification Success		90.43%		90.72%
Area Under ROC Curve		0.7960		0.8162
Model Fit Statistics		Pearson chi2(679) =674.66 p>0.05 PseudoR^2= 0.2475 (p<0.05)		Pearson chi2(667) = 637.72 p>0.05 PseudoR^2=0.2650 (p<0.05)

In the analysis of organizational innovation model, it can be observed that the degree of use of in-house information sources is the most effective positively contributing variable, followed by the networking factor and the number of staff members (logemployee) variable. Again, license and know-how purchasing expenses have been found to have negative effects as R&D variables. Among the variables affecting organizational innovations, which contribute positively, the number of employees and networking factor are thought to be a rational consequence.

In the marketing innovations model, variables of networking factor, openness for information sources, and the degree of using in-house information sources are statistically important. All of these variables have positive coefficients. Studying the odds ratio, it can be seen that these are almost equally sized. In the model fit statistics of these two models, the models are found to be statistically important.

Finally, in the assessment of all the models as a whole, it can be asserted that product and service innovations models are the more successful. Besides, it is considered to be a

significant finding that the degree of use of in-house information sources is statistically meaningful for all models. It is, however, debatable that while R&D expenses are expected to contribute to the production of information positively, negative effects are observed in the models built for other innovation types except for product innovations. Upon the assessment of the hypotheses within the framework of the findings obtained the results in Table 4 have been acquired.

Table 4: Results of the Hypotheses

Hipotezler/İnovasyon Türleri	Product Innovation	Service Innovation	Organizational Innovation	Marketing Innovation
H_1	+	+	+	+
H_2	NSS*	+	NSS	+
H_3	NSS	NSS	NSS	NSS
H_{4a}	+	-	NSS	NSS
H_{4b}	NSS	NSS	NSS	NSS
H_{4c}	NSS	NSS	-	NSS
H_5	NSS	NSS	+	+
H_6	NSS	NSS	NSS	NSS
H_7	NSS	NSS	NSS	NSS
H_8	-	NSS	+	NSS
H_9	NSS	NSS	NSS	NSS

In regard to the analysis of all hypotheses as a whole, the first hypothesis was accepted for all innovation types. The second hypothesis was accepted for service and marketing innovations but no meaningful relation was found to exist with other types of innovation. When the third, sixth, seventh and ninth hypotheses and hypothesis 4B were analyzed no statistically meaningful relation was found for any of the innovation types. While hypothesis 4A was accepted for product innovations, it was rejected for service innovations. Hypothesis 4C was rejected only for organizational innovations, and no meaningful relation was found with other types of innovation. The fifth hypothesis was accepted only for organizational innovations and marketing innovations. Finally, the eighth hypothesis was rejected for product innovations but accepted for organizational innovations.

5. DISCUSSION AND CONCLUSION

As Grawe (2009) and Wagner (2008) also state innovations in logistics sector is an issue, which is not dealt sufficiently by researchers. Moreover, Shen *et al*. (2009) express that innovations in logistics sector are not carried out at high levels despite the feedbacks acquired. However, when the findings obtained are assessed, it can be seen that production of information is especially cared by innovating firms in logistics sector as well. It is among the findings that despite being at low degrees, firms benefit from almost all types of innovation. Farias and Akabone (2011) state that logistics innovations are important when they add value to clients and therefore to the firm.

When the findings acquired and odds ratios of the variables, or degrees of effectiveness, are displayed on a network diagram to be compared according to innovation types, the following Figure 2 is obtained.

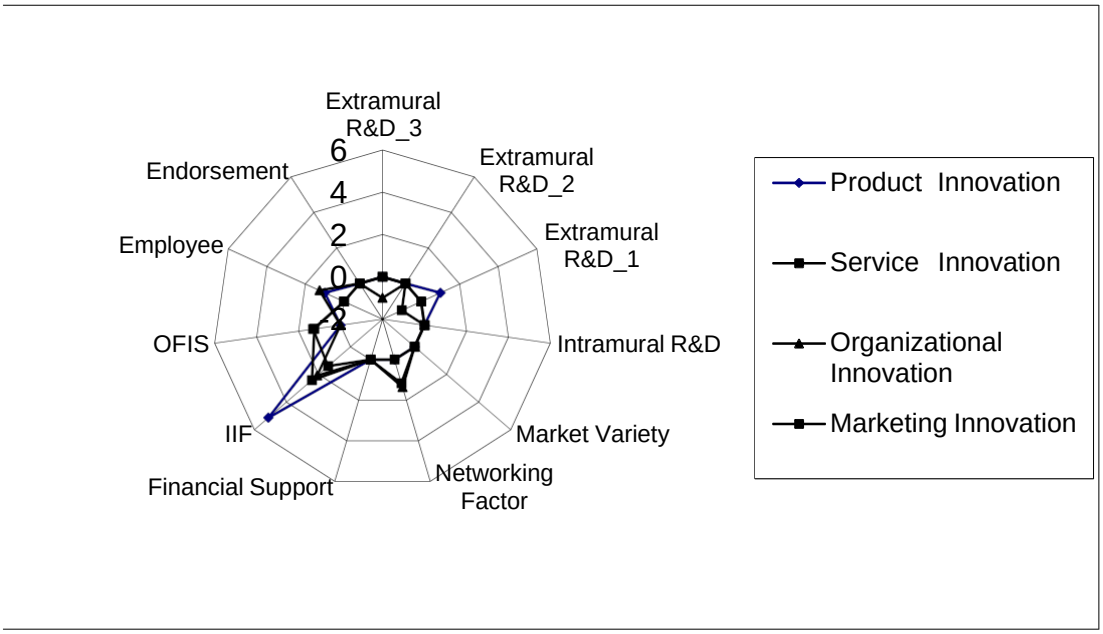

Figure 2: Comparision of Independent Variables' Impacts

In Figure 2, the importance of in-house information sources in making innovations for all types can be clearly observed. Here, the convex structure of marketing innovations suggests that the need for in-house information sources is small. However, from the same point of view, it is acceptable that marketing innovations also follow a strategy that is open to external information sources and pay attention to networking.

In the analysis of the results as a whole in logistics sector, again the determinants of product innovations follow a very different direction from others. In marketing and organizational innovations, however, a similar structure can be found. Furthermore, it is extremely interesting to note that the effect of financial variables is not statistically important. Moreover, the fact that market diversity is not statistically important can be interpreted as firms' tendency to continue their existing processes when penetrating into new markets.

In parallel with the literature, R&D variables were detected to have either very small scale or statistically meaningless relations. This finding supports the findings of Wagner (2008). Firms in the logistics sector do not consider R&D activities necessary for innovations. One reason for this is thought to be the fact that R&D is usually associated with production. Therefore, logistic firms may prefer directing limited resources to other aspects of their business.

The structure of supply chain requires the firms to act as a whole instead of innovating separately. The interactive nature of logistic innovation supports this as well. Logistics innovation intrinsically contains a high degree of technology and product/service innovations. By so doing it supports the concept of on time supply, which can promptly satisfy the needs, and requests of clients.

What is more, the fact that production sector deals with logistics activities within a system approach, and sees them as an area to take an advantage for competition presents a need for innovation which not only concerns the services sector but also the economy as a whole.

Logistics innovations allow for overcoming time limitations in the short term, creating values in the supply chain in the middle term and sharing of this not only with a single company but also with other components. In the long term, these increases in value offer an opportunity for the company to raise its competitive power and extend in a way to provide sustainability. Such a structure has required policy makers to put forward some suggestions:

In order to encourage their innovation activities, companies should be provided with financing and education on the degree of using in-house information sources and openness for information sources. In order for in-house information to be better used, committees should be formed consisting of inter-disciplinary representatives, such as those in the structure of network organizations. Moreover, this team should play a role in the use of external information sources:

- The rise in extramural R&D expenses may lead innovation to be perceived as a matter, which can only be dealt with the use of external sources. This point should be explained correctly and the idea that innovation is a matter each employee can contribute to like in the matter of quality should be highlighted.
- NGOs, especially those in logistics sector, should take advantage of the interactive structure of logistic innovations with network structure and should make use of the network structure in a way that supports logistic innovation.
- Logistics companies competing against time –greatest and least forgiving rival- can win against this common rival through innovation. To achieve this aim, in addition to fairs and business meetings, working committees on the subject, joint case analysis studies and education activities can be carried out.
- Companies should pay attention to the strategy they employ and the structure of competition rather than the size of the market. Companies should also attach importance to logistics service innovation and differentiation within competition strategies especially with logistics activities coming up as a distinctive feature.

As a result, it can be asserted that the types of innovation carried out in logistics services are parallel with work in production sector. Therefore, building common value nodes in the information production of manufacturing and distribution firms within the supply chain can create a synergic affect. However, the issue how the personnel formation of these value points should be formed and by whom the strategic orientation should be organized comes up as a new research subject.

6. LIMITATIONS AND FURTHER RESEARCH IMPLICATIONS

As Laursen and Salter (2006) state research carried out on large scale databases bring about several questions as to the applications of research methods relying on observations, which are not obtained directly. The most importation limitation for this study is that the quality of transportation firms is unknown. This is because logistic firms can be defined as logistic service suppliers, logistic firms and distribution firms. It is considered that differences among the innovation strategies of these defined firms may occur depending on the specific work they carry out and basic abilities they perceive as important. CIS classifies transportation firms in this aspect.

Another limitation is that a combination of perceptual data and measurements taken directly are used together. In this respect, the quality of the data acquired by the CIS carried out on a national base can be claimed to constitute one of the limitations. Moreover, the firm based research was carried out under the assumption that the participants provided accurate information for the data acquired from this survey. In addition, innovation is known to have a quality aspect along with its quantity aspect. In other words, while some innovations provide firms with high profits some bring low earnings. In this study whether making innovations or not was taken a variable but the quality of the innovation made was ignored here. This situation is also accepted as a limitation for this study.

For the future CIS, it is considered beneficial to include obstacles faced with in the process of innovation, along with some issues specific to the services sector. For future research, there are obvious benefits in examining the variables to be used in the survey, especially those that can increase the effect of innovation in more detail.

By separating data according to the size of the enterprises and examining small, SME and large enterprises separately, it is likely that more detailed information can be reached in the future studies. Also the cultural perspectives can be considered as stated in Lee *et al*. (2011) and firms' innovation and entrepreneurial orientation capacity will be determined with multi-cultural studies.

REFERENCES

Aas, T. H., & Pedersen, P.E. (2010), "The impact of service innovation on firm-level Financial performance", *The Service Industries Journal*, 31(1): 1-20.

Akehurst, G. (2008), "What do we really know about services?" *Service Business, 2*(1): 1-15.

Andersson, D., & Norman, A. (2002), "Procurement of logistics services – a minute's work or a multi-year project?" *European Journal of Purchasing & Supply Management*, 8(1): 3-14.

Arvanitis, S. (2008), "Explaining innovative activity in service industries: Micro data evidence for Switzerland", *Economics of Innovation and New Technology*, 17(3): 209-225.

Arroniz, I., Sawhney M., & Wolcott, R.C. (2005), "The 12 different ways of company to innovate", *MIT Sloan Management Review*, 47(3): 76-81.

Autry, C.W., & Griffis, S.E. (2008), "Supply chain capital: The impact of structural and relational linkages on firm execution and innovation", *Journal of Business Logistics*, 29(1): 157-174.

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

Bergh, P., Thorgren, S., & Wincent, J. (2011), "Entrepreneurs learning together: The importance of building trust for learning and exploiting business opportunities", *International Entrepreneurship and Management Journal*, 7(1): 17-37.

Bolton, R., Grewal, D., & Levy, M. (2007), "Six strategies for competing through service: an agenda for future research", *Journal of Retailing*, 83(1): 1-4.

Busse, C. (2010), "A procedure for secondary data analysis: Innovation by logistics service providers", *Journal of Supply Chain Management*, 46(4): 44-58.

Busse, C., & Wallenburg, C. M. (2011), "Innovation management of logistics service providers' foundations, review, and research agenda", *International Journal of Physical Distribution & Logistics Management*, 41(2): 187-218.

Cainelli, G., Evangelista, R., & Savona, M. (2004), The impact of innovation on economic performance in services. *The Service Industries Journal*, 24(1): 116-130.

Camacho, J. A., & Rodriguez, M. (2008), "Patterns of innovation in the service sector: some insights from the Spanish innovation survey", *Economics of Innovation and New Technology*, 17(5): 459-471.

Cambra-Fierro, J., Florin, J., Perez, L., & Whitelock, J. (2011), "Inter-firm market orientation as antecedent of knowledge transfer, innovation and value creation in networks", *Management Decision*, 49(3): 444-467.

Cantarello, S., Nosella, A., Petroni, G., & Venturini, K. (2011), "External technology sourcing: Evidence from design-driven innovation", *Management Decision*, 49(6): 962-983.

Castro, L.M., Sanchez, A.M., & Criado, M.O.D.U. (2011), "Innovation in service industries: Current and future trends", *The Service Industries Journal*, 31(1): 7-20.

Chamberlin, T., Douitriaux, J. & Hector, J. (2010), "Business success factors and innovation in Canadian service sectors: An initial investigation of inter-sectoral differences", *The Service Industries Journal*, 30(2): 225-246.

Chapman, R.L., Soosay, C., & Kandampully, J. (2003), "Innovation in logistic services and the new business model – a conceptual framework", *International Journal of Physical Distribution & Logistics Management*, 33(7): 630-650.

Coombs, R., & Miles, I. (2000), "Innovation measurement and services: The new problematique", J.S. Metcalfe & I. Miles (Eds.), *Innovation Systems in the Service Economy: Measurements and Case Study Analysis,* Boston: Kluwer, pp. 85–103

Council of Logistics Management (2003), http://www.clm1.org., Retrieved 10.06.2015.

Evangelista, R. (2000), "Sectoral patterns of technological change in services", *Economics of Innovation and New Technology*, 9(3): 183-221.

Flint, D. J., Larsson, E., Gammelgaard, B., & Mentzer, J. T. (2005), "Logistics innovation: A customer value-oriented social process", *Journal of Business Logistics*, 26(1): 113-147.

Goktan, A. B., & Miles, G. (2011), "Innovation speed and radicalness: Are they inversely related?" *Management Decision*, 49(4): 533-547.

Grawe, S. J. (2009), "Logistics innovation: A literature-based conceptual framework", *The International Journal of Logistics Management*, 20(3): 360-377.

Den Hertog, P., & Bilderbeek, R. (1999), *Conceptualising service innovation and service innovation patterns* (Research Programme on Innovation in Services (SIID) for the Ministry of Economic Affairs). Utrecht, The Netherlands: Dialogic.

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

De Farias, O.O., & Akabane, G.K. (2011). Innovation and creativity on logistics besides TRIZ methodology. *Procedia Engineering*, *9*, 724–729.

Hakansson, H., & Persson, G. (2004), "Supply chain management: The logic of supply chains and networks", *The International Journal of Logistics Management*, 15(1): 11-26.

Ho, Y.C., Fang, H.C., & Lin, J.F. (2011), Technological and design capabilities: Is ambidexterity possible? *Management Decision*, 49(2), 208–225.

Hollenstein, H. (2003). Innovation modes in the Swiss service sector: A cluster analysis based on firms-level data. *Research Policy*, 32(5): 845-863.

Laursen, K., & Salter, A. (2006), "Open for innovation: The role of openness in explaining innovative performance among UK manufacturing firms", *Strategic Management Journal*, 27(2): 131-150.

Lee, S.M., Lim, S.B., & Pathak, R.D. (2011), "Culture and entrepreneurial orientation: A multi-country study", *International Entrepreneurship and Management Journal,* 7(1): 1-15.

Lin, C. (2006), "Influencing factors on the innovation in logistics technologies for logistics service providers in Taiwan", *The Journal of American Academy of Business*, 9(2): 257-263.

Manrodt, K. B., Holcomb, M. C., & Thompson, R. H. (1997), What's missing in supply chain management? *Supply Chain Management Review*, 1(3): 80-6.

Mena, C., Christopher, M., Johnson, M., & Jia, F. (2007), *Innovation in Logistics Services* (Report). Cranfield: Cranfield University School of Management.

Mentzer J., Myers, M. B., & Cheung, M. (2004), "Global market segmentation for logistics services", *Industrial Marketing Management*, 33: 15-20.

Morash, E. A., Droge, C. L. M., & Vickery, S. K. (1996), "Boundary-spanning interfaces between logistics, production, marketing and new product development", *International Journal of Physical Distribution & Logistics Management*, 26(8): 43-62.

Nelson, R. R. (2000), "Knowledge and innovation systems", In *Knowledge management in the learning society* (pp. 115–124). Paris: Organization for Economic Co-operation and Development (OECD).

OECD (2005), *The Measurement of Scientific and Technological Activities, Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data*. Paris: Organization for Economic Co-operation and Development (OECD).

Olavarietta, S., & Ellinger, A. E. (1997), "Resource based theory and strategic logistics research", *International Journal of Distribution & Logistics Management*, 27(9/10): 559-587.

Panayides, P. M., & So, M. (2005), "Logistics service provider-client relationships", *Transportation Research Part E, Logistics and Transportation Review,* 41E(3): 179-200.

Pavitt, K. (1984), "Sectoral patterns of technical change: Towards a taxonomy and a theory", *Research Policy*, 13: 343-373.

Potts, J., & Mandeville, T. (2007), "Toward an evolutionary theory of innovation and growth in the service economy", *Prometheus,* 25(2): 147-159.

Richey, R. G., Genchev, E., & Daugherty, P. J. (2005), "The role of resource commitment and innovation in reverse logistics performance", *International Journal of Physical Distribution & Logistics Management,* 35(4): 233-257.

Rowley, J., Baregheh, A., & Sambrook, S. (2011), Towards an innovation-type mapping tool. *Management Decision*, 49(1): 73-86.

Salter, A., & Tether, B. (2006), *Innovation in services: Through the looking glass of innovation studies,* Oxford: Oxford University.

Sauvage, T. (2003), "The relationship between technology and logistics third-party providers", *International Journal of Physical Distribution & Logistics Management*, 33(3): 236-253.

Schiavone, F. (2011), "Strategic reactions to technology competition: A decision-making model", *Management Decision*, 49(5): 801-809.

Shen, H., Wang, L., Xu, Q., Li, Y., & Liu, X. (2009), "Toward a framework of innovation management in logistics firms: A systems perspective", *Systems Research and Behavioural Science*, 26(2): 297-309.

Sitlington, H., & Marshall, V. (2011), "Do downsizing decisions affect organizational knowledge and performance?" *Management Decision*, 49(1): 116-129.

Soete, L., & Miozzo, M. (1989), *Trade and development in services: a technological perspective* (Working Paper No. 89–031). Maastricht: MERIT.

Soete, L., & Miozzo, M. (2001), "Internationalisation of services: A technological perspective", *Technological Forecasting and Social Change*, 67(2-3): 159-185.

Sommer, L., & Haug, M. (2011), "Intention as a cognitive antecedent to international entrepreneurship–understanding the moderating roles of knowledge and experience", *International Entrepreneurship and Management Journal*, 7(1): 111-142.

Soosay, C. A., & Hyland, P.W. (2004), "Driving innovation in logistics: Case studies in distribution centres", *Creativity in Innovation Management*, 13(1): 41-51.

Soosay, C.A., Hyland, P.W., & Ferrer, M. (2008), "Supply chain collaboration: Capabilities for continuous innovation", *Supply Chain Management: An International Journa*l, 13(2): 160-169.

Stalk, G., Evans, P., & Shulman, L.E. (1992), Competing on capabilities: The new rules of corporate strategy. *Harvard Business Review*, 70(2): 57-69.

Sundbo, J., & Gallouj, F. (1999), *Innovation in services in seven European countries.* (Synthesis Report for EU Commission, DG XII, TSER-SI4S). Denmark: Roskilde University.

Tether, B.S. (2005), "Do services innovate (differently)? Insights from the European Innobarometer Survey", *Industry and Innovation*, 12(2): 153-184.

Tidd, J., Bessant, J., & Pavitt, K. (2001), *Managing innovation: Integrating technological, market and organizational change,* Chichester: John Wiley & Sons.

Toivonen, M., & Tuominen, T. (2009), "Emergence of innovations in services", *The Service Industries Journal*, 29(7): 887-902.

Tourigny, D., & Le, C. D. (2004), "Impediments to innovation faced by Canadian manufacturing firms", *Economics of Innovation & New Technology*, 13(3): 359-369.

Van Ark, B., Broesma, L., & Hertog, P. (2003), *Services innovation, performance policy: A review, synthesis report in the framework of the project structural information provision on information in services*. The Netherlands: University of Groningen and The Conference Board, DIALOGIC and Innovation Studies, Utrecht University.

Van Riel, A.C.R., Semeijn, J., Hammedi, W., & Henseler, J. (2011), "Technology-based service proposal screening and decision-making effectiveness", *Management Decision*, 49(5): 762-783.

Vasconcellos e Sá, J.A., Olão, F., & Pereira, M. (2011), From Levitt to the global age: One more time, how do we define our business? *Management Decision*, 49(1): 99-115.

Vence, X., & Trigo, A. (2009), "Diversity of innovation patterns in services", *The Service Industries Journal*, 29(12): 1635-1657.

Wagner, S.M. (2008), "Innovation management in the German transportation industry", *Journal of Business Logistics*, 29(2): 215-231.

Zhang, Z., He, J., Gui, S., & Shi, Y. (2008, October), *Research on the impetus of logistics innovation in the industrial evolution.* Paper presented at the 4th International Conference on Wireless Communications, Networking and Mobile Computing, WiCOM '08, Dalian, China.

Zhao, D., & Wang, M. (2010, August), *Research on logistics business outsourcing and logistics service innovation.* Paper presented at the International Conference on Management and Service Science (MASS), Wuhan, China.

Serhat Burmaoglu is an Associate Professor at İzmir Katip Çelebi University. He has graduated from Defence Sciences Institute Logistics Management MBA Programme in 2006. He has received his PhD from Quantitative Methods for Business Programme (Ataturk University) in 2009. His research interest is investigating the relationship between economic growth, productivity, competitiveness, innovation and knowledge economy in macroeconomic level by using multivariate statistical analysis and data mining applications for extracting usable patterns to direct development policies.

Serhat Burmaoğlu İzmir Katip Çelebi Universitesinde doçenttir. 2006 yılında Savunma Bilimleri Enstitüsü Lojistik Yönetimi MBA programından mezun olmuştur. Doktora derecesini 2009 yılında Atatürk Üniversitesi Sayısal Yöntemler alanından almıştır. Araştırma ilgi alanları ekonomik büyüme, verimlilik, rekabet edebilirlik, inovasyon ve bilgi ekonomisi konularına odaklanmakta, gelişim politikalarına yön verecek çok değişkenli istatisitksel yöntemler ve veri analizi çalışmaktadır.

Harun Sesen is an Associate Professor at the European University of Lefke. He has received his PhD from Defence Management for Business Programme (Defence Sciences Institute) in 2010. His research interests include competitiveness, innovation, entrepreneurship and strategic management.

Harun Şeşen Lefke Avrupa Üniversitesinde doçettir. Doktora derecesini 2010 yılında Savunma Bilimleri Enstitüsü Savunma Yönetimi programından almıştır. Araştırma ilgi alanları rekabet edebilirlik, inovasyon, girişimcilik ve stratejik yönetim konularıdır.

Yigit Kazancoglu is an Associate Professor in the Izmir University of Economics. He has graduated MBA from Coventry University, England, and Izmir University of Economics in 2003 and 2004, respectively. He has received his PhD at Ege University (Production and Operations Management) in 2008. His areas of interest include production planning and control, operations research, multi-criteria decision-making, fuzzy systems and total quality management.

Yiğit Kazançoğlu İzmir Ekonomi Üniversitesinde doçenttir. 2003 yılında İngiltere Coventry Üniversitesi ve 2004 yılında İzmir Ekonomi Üniversitesi MBA programlarından mezun olmuştur. Doktora derecesini 2008 yılında Ege Üniversitesi Üretim ve Harekât Yönetimi alanından almıştır. Araştırma ilgi alanları üretim planlama ve kontrol, harekât araştırması, çok kriterli karar verme, fuzzy sistemler ve toplam kalite yönetimi gibi konuları kapsamaktadır