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An extended approach for service innovation study: an empirical research

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1. Introduction

Initially, service sector was defined as complementary to manufacturing sector. This situation has changed in recent times; services growth has resulted in a dominance of employment and economic activity in most developed nations and is becoming a key process for the competitiveness of their industrial sectors. New services related to commodities have become a strategy to differentiate their value proposition (Robinson et al., 2002). The service sector's importance is evident when evaluating its share in the gross domestic product. According to the World Bank (2011), in 2009, 74.8% of GDP in the euro area and 77.5% in United States were attributed to services.

Globalization and use of information and communication technology has accelerated dissemination of knowledge and increasing customer expectations about services available worldwide. Innovation becomes essential to ensure that service organizations respond with appropriate products and services for each market segment. Customized and placed on time-to-market new services require a more developed innovation process. Service innovation and new service development process are cited as one of the priorities for academic research in the following years (Karniouchina et al., 2005).

In this vein, this paper has the following objectives:

- To present a model for the analysis of innovation process through the service value network,
- To verify its applicability through an empirical research, and
- To identify the path and mode of innovation for a group of studied organizations and to compare it with previous studies.

2. Theoretical Considerations

2.1 Service and Innovation Concepts

According to Gadrey (1992), service is defined as the set of processing operations carried out by a service provider (B) on behalf of a client (A), in a medium (C) held by A, and intended to bring about a change of state in the medium C. More recently, it has been proposed (IfM and IBM, 2008) the concept of service system. This is defined as a dynamic configuration of resources (people, technology, organizations and shared information) that creates and delivers value between service provider and customer through service.

In the unified theory of services (Froehle and Sampson, 2006), the concept of bidirectional services supply chain has an expanded role for customers, namely as suppliers of inputs to service provider processes. Customers not only provide information, but in most cases they are, along with suppliers, service co-producers. From the operational and cultural dimensions, it suggests the service centered value network concept. This is defined as the set of activities, in the context of an extended process, where suppliers, service provider and customers co-produce the service and co-create value to obtain an expected result in a specific cultural environment. This concept shows more strongly the co-production dimension and expanded the scope of service innovation (Figure 1). The concept originates operational demands of alignment, communication, expanded responsibility of service provider and coordination of strategic activities, including innovation.

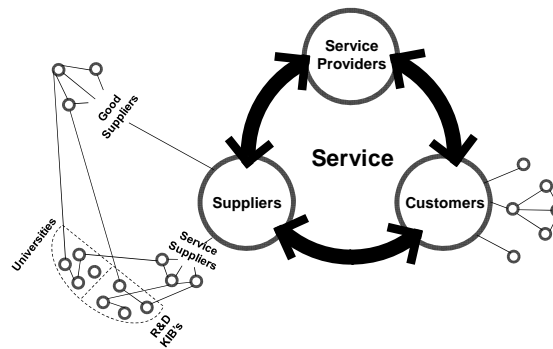


Figure 1 The service centered value network

2.2 Innovation Models

Initially, studies of innovation processes were related to technological innovation (Chiesa, Coughlan and Voss, 1996, COTEC, 1999, Goffin & Pfeiffer, 1999). More recently, research on how innovation takes place in service organizations (COTEC, 2004; Tether and Tajar, 2008, Den Hertog et al. 2010) has allowed better understanding of its paths and modes of innovation. This study is initially based on the analysis of non-technological innovation and its innovation modes (Tether and Tajar, 2008) and the innovation framework TEMAGUIDE developed by coordination of Fundacion COTEC (1999).

Tether and Tajar (2008) provide a model of innovation based on three dimensions:

- Type of innovation (product or process),
- Technology (hard or soft) and
- The locus of innovation (internal to the firm or interorganisational).

Based on the experience of the European Innovation Survey (CIS-4) they identified three modes of innovation:

- Product oriented, present in high-tech manufacturing organizations,
- Technological processes oriented, typical of low-tech manufacturing firms, and
- Organizational-cooperation oriented; prevalent in service organizations.

Firms engaged in the Organizational-Cooperation mode of innovation have innovation activities oriented to organizational changes, and observed at least two of the three following characteristics: cooperation with suppliers or customers as a main source of advanced technology; good cooperation practices with suppliers, customers and trade associations; and the qualifications and professionalism of the workforce as a main strength at innovation.

TEMAGUIDE is the result of a research made by a group of European organizations (COTEC, 1999). In this work, innovation processes are explained through five phases: monitoring, focusing, building competences, implementing and learning. The framework is conceived as a tool for study of technological innovation and provides a methodology to change management. Initially developed for the manufacturing sector, this model was applied to the study of innovation in service organizations in Spain (COTEC, 2004).

3. The Proposed Seven Phase's Innovation Model

With the aim of expanding the COTEC framework introducing the service centered value network concept, we propose a seven phase's innovation model. This new framework for the analysis of innovation process in service organizations consists of the five original phases from the COTEC framework; monitoring (M), focusing (F), building competences (Bc), implementing (I) and learning (Lr) and the new phases of leading (Ld) and co-operating (Co). It allows evaluating an innovation leadership of service organization and checking if its internal innovation process is aligned and co-operate with customers and suppliers.

The phase of "leading" is the set of leadership and strategic innovation planning activities required to define and evaluate the vision, goals and objectives related to innovation in the context of the organization strategy and its implications and requirements with respect of other service value network members. The phase of "Co-operating" is defined as the set of values, beliefs and activities of co-creation, collaboration, communication, operational alignment and guidance, that management has on how they should develop the innovation process jointly with its employees, suppliers and customers. The phase of "Co-operating" analyzes to what extent the innovation process is oriented to the service value network. Therefore, the seven phase's innovation model would be able to assess to what extent the so-called "oriented to the service value network" path of innovation is present, in which the service provider is leader and responsible for service co-production and its innovation process. The elements of seven phase's innovation framework (7P's) are illustrated in Figure 2.

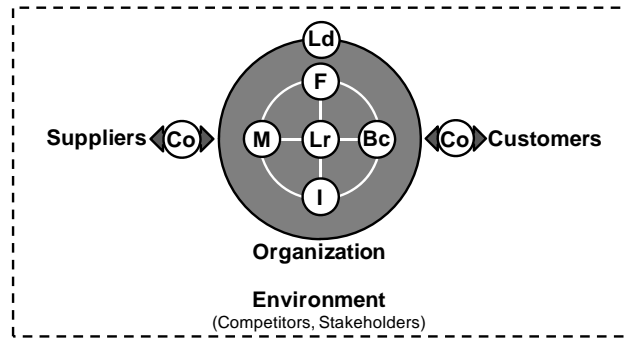


Figure 2. Seven phase's innovation framework

Each phase is studied from activities, tools and techniques present through the innovation process of service organization. In order to identify organizations that carry out the most developed innovation process, we propose an innovation process development index, defined as the sum of the mean values for each of the seven phases, where the outcome of each phase is the average of the values obtained for each of its variables.

$$IPDI = \sum_{i=1}^7 \bar{F}_i, \quad \text{where} \quad \bar{F}_i = \frac{\sum_{j=1}^n v_{ij}}{n} \quad (1)$$

Given that each stage has a different number of variables, the mean value of each phase is used to calculate the index. Each phase (F_i) is evaluated on a Likert scale from one (low) to five (high); the maximum value of the Innovation Process Development Index (IPDI) is 35.

4. Empirical Study Development

To determine the applicability of the seven phase's framework, a research instrument called the survey of service innovation was made through the following steps: preparation of a draft based on the results of in-depth interviews with experts from each service sector, initial testing and correcting identified problems to specific questions. Finally, the questionnaire was configured around a set of 51 questions, related to 39 variables.

The survey was sent to senior managers, or instead to those with extensive knowledge about innovation process within the organization, who were capable of answering the survey by themselves or who were able to contact people who could answer those questions they didn't know, or to those individuals who have the ability to coordinate working groups to answer the survey, as it has been done in other studies in the field of innovation (O'Regan et al., 2006).

The survey was applied in three sectors: trade, healthcare and education. Due to heterogeneity of each sector, a subsector considered an innovation benchmark was selected; chain stores in the trade sector, high ranked private hospital in the health care sector and universities with engineering faculty in the education sector. The study population was composed of a total of 124 organization, 71 chains stores, 16 high ranked private hospital and 37 universities with engineering faculty. The survey was randomly sent to contacted organizations. A total of thirty organizations responded, twelve chains stores, eight high ranked private hospitals and ten universities with engineering faculty. The group of service organization surveyed was analyzed by experts, who considered it relevant to show the innovation reality for these sectors in Venezuela.

5. Framework Validation: Reliability, Functionality and Applicability

5.1 Reliability Analysis

The data obtained were entered in the software SPSS (version 17), which was used to determine both the Cronbach's alpha and corrected Pearson's coefficient, statistical values that will determine whether the recorded values and the scales used in the survey were reliable.

The values for both Cronbach's alpha and standardized Cronbach's alpha were high, above 0.950 in both cases, showing the survey's internal consistency and reliability.

5.2 Beta Testing

In order to verify functionality, use and utility, we developed and implemented a beta test for the instrument. Unlike the alpha test, in which the client or user is invited to visit the instrument's developer environment, beta testing is applied on the client or user environment, beyond the control of the developer.

Dolan and Matthews (1993) suggest a set of conditions under which the application of a beta test might be appropriate: (i) users are heterogeneous, (ii) the potential applications are not fully understood, (iii) the application of an alpha test does not guarantee an error proof product, and (iv) there are limitations to the sample size due to complexity. Each of the four factors mentioned above show that the application of a beta test was relevant for our study.

In a similar way by which Chiesa et al. (1996) tested their research instrument, a technical innovation audit, beta test was applied to the survey of service innovation, it was sent to a total of ten organizations and seven answered surveys were received. This is a similar size to that of the typical reported beta test by Dolan and Matthews (1993).

Regarding the functionality of the survey, four different statements were evaluated. They referred to the instrument ability to characterize in a simple way the innovation process, the ability of the innovation survey to identify practices in innovation management that are carried out in the organization., the degree to which it allows to identify tools used to support innovation and the last statement sought to establish the ability of the instrument to be used in any type of organization. All of them showed a good agreement with every statement.

To evaluate use, the beta test was intended to establish the survey simplicity. All organizations, to a greater or lesser extent, agreed that questionnaire used a comprehensible language.

To evaluate utility, first statement referred to perceived value of survey. Six organizations said instrument added value to their businesses. The second question was about whether instrument allowed them to identify improvement areas in processes and innovation management practices. All organizations agreed that the service innovation survey helped to achieve these objectives. The third question related to the feasibility to incorporate it as a tool for implementing an annual audit. Most of the companies surveyed (five of seven) felt that their organization is likely to adopt this tool.

From the obtained answers it can be concluded that the survey of service innovation is an instrument easy to use, functional and useful for organizations studied. In summary, good results of reliability analysis and beta testing support reliability, functionality and applicability of the seven phase's innovation model for studied organizations.

6. Results

6.1 Leader group Identification: Cluster Analysis

Cluster analysis is a multivariable technique that aims to group elements (or variables) so that, on the one hand, objects belonging to the same group are very similar to each other, i.e. the group is internally cohesive and, on the other, objects belonging to different groups have different behavior with respect to these variables, i.e. each group is externally isolated from the other groups.

The cluster analysis technique was applied to thirty surveyed organizations for the group of 39 variables that measure the seven innovation phases. Several available methods for hierarchical classification were applied (between-groups linkage, within-groups linkage, nearest neighbor, furthest neighbor, centroid clustering, median clustering and Ward's method), and the proximity method used was the squared Euclidean distance.

The results obtained for the group of leading organizations, for each phase and the IPDI for each organization is shown in Table 1:

Table 1. Innovation process development index: leading group

Organization	Phase							IPDI
	Ld	M	F	Bc	I	Lr	Co	
N° 11	4.40	4.25	4.50	4.00	3.92	4.33	4.71	30.12
N° 10	4.60	3.75	3.25	4.00	3.85	3.67	4.86	27.97
N° 30	4.00	3.00	3.25	4.00	3.69	3.00	5.00	25.94
N° 22	3.00	3.50	3.50	3.33	3.85	4.33	4.43	25.94
N° 7	4.20	4.50	2.50	4.00	3.08	2.00	4.14	24.42
Average	4.04	3.80	3.40	3.87	3.68	3.47	4.63	26.88

The dendrogram in Figure 3 shows the result from the cluster analysis using the square Euclidean distance as proximity and the between groups linkage as hierarchical classification method.

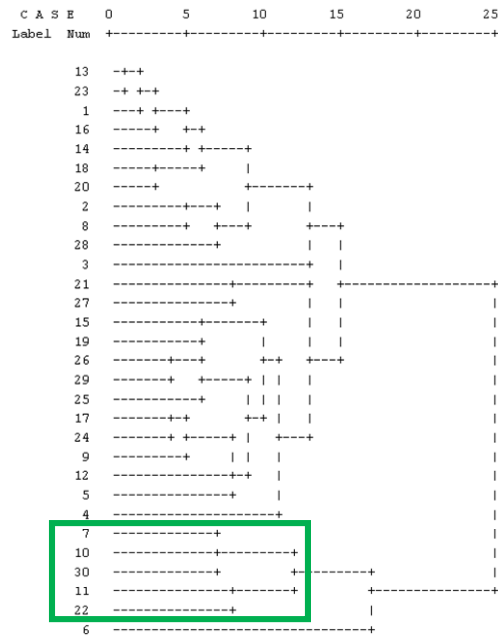


Figure 3. Dendrogram for 30 studied service organizations

As we can see from Table 6.1 and dendrogram, it is clear the existence of a group of leading innovation organizations composed by organizations number 7, 10, 30, 11 and 22. These organizations obtained the five highest IPDI in the sample.

6.2 Leading Group Characterization and Innovation Practices Profile

The leading group was constituted by three organizations from retail sector, one from healthcare sector and one from the education sector. This group represents 16.7% of organizations surveyed and 4% of population belong to studied sector. The organization with the highest innovation process development index is a service organization which belongs to retail sector, with over 166 stores in Venezuela and approximately 2.800 employees.

The "leading" phase for the leading group is characterized by a high degree of organizational leadership involvement in the innovation projects. The main activities carried out are research and development both internal and external, product, equipment and facilities design, market innovations and staff training are part of the organization's strategy.

For the "monitoring" phase, the leading group is characterized by a formal monitoring of competitive intelligence activities, technology surveillance, regulatory oversight, industrial property rights and the life cycle analysis of its innovation portfolio. The group uses most of the sources of information available, which include internet, publications, consultancy firms, employees and suppliers' opinions, as well as journals and conferences. Regulatory oversight is the most organized activity.

For the "focusing" phase, the leading group has established procedures for selection of innovation projects aligned with its strategy, but it shows a low formal use of techniques for generating ideas and selecting projects.

For the "building competence" phase, the leading group does external staff acquisition, internal training and external technology acquisition, particularly the recruitment of consulting services and acquisition of equipment and accessories. In general, leading organizations have a training and development plan that includes aspects related to support its innovation projects.

For the "implementing" phase, most organizations from the leading group continually plan the introduction of new products and services within a long-term plan. Even when they could be pioneers in some of its innovations, the majority of such projects are incremental; they are based on improvements of existing services within or outside the organization. On average, product, service and process innovations are performed annually; organizational innovation is performed with a frequency of one to three years. Most used techniques are processes reviewing and documentation, brainstorming, value analysis and reengineering.

Leading organizations have a person responsible for the "learning" phase. They have defined innovation project management indicators. Leading organizations carried out successes and gaps analysis for each phase of the innovation process in order to incorporate learned lessons. Business case is the least established practice, as it is applied only by two leading organizations.

For leading organizations "co-operating" was the most developed phase. There is a wide adoption of cooperative activities with customers and suppliers. Leading organizations share resources and talents with their customers, suppliers, universities and research centers. It shows how they co-develop their innovation projects with other members of the service value network.

6.3 Leading Group Innovation Path and Mode

Another objective from this research is to identify the innovation path for leading organizations, and to validate findings from Tether and Tajar (2008) regarding to the mode of innovation for service organizations.

To evaluate innovation path, we considered three variables related to the orientation of innovation to suppliers, customers, universities and research centres. It assesses the degree to which an organization orients its innovation activities outdoors. By evaluating average results for each segment, it is clear that leading organizations strongly orient the development of their innovation processes to suppliers, customers, universities and research centers, something that does not happen with the remaining surveyed organizations, as shown in Table 2.

Table 2. Evaluation of the innovation orientation

Organizational segment	Innovation orientation towards:			Average
	Suppliers	Clients	Universities and research centers	
Leading organizations	5.00	4.60	4.00	4.53
Remaining organizations	2.80	3.16	2.44	2.80
Total sample	3.17	3.40	2.70	3.09

Results confirm that leading service organizations follow the path that we define as "oriented to the service value network", in which service provider develops its innovation projects involving both service co-producers: suppliers and customers, and also Universities and research centers.

To evaluate the mode of innovation applied by the group of leading organizations, we considered variables related to the orientation of innovation towards suppliers, customers and universities and research centers and those for product/service, process, and organizational innovation activities. By evaluating average results for each organizational segment, it shows all five leading organizations are far more active in developing their innovations, technological and non- technological, than the remaining twenty five. From Table 3 it is also noted that all innovation activities have a similar level:

Table 3. Evaluation of innovation activities phase: "implementing"

Organizational segment	Innovation activities from the type			Average
	Product or service	Process	Organizational	
Leading organizations	3.00	3.00	3.20	3.07
Remaining organizations	1.64	1.88	1.50	1.67
Total sample	1.87	2.07	1.78	1.90

When considered together, the values for the orientation and innovation activity type variables, we obtained a value that reflects the intensity in which organizations apply the cooperation mode of innovation (see Table 4):

Table 4. Average results for cooperation mode of innovation

Organizational segment	Average
Leading organizations	3.80
Remaining organizations	2.24
Total sample	2.50

According to Tether and Tajar (2008), organizations that practice the organizational-cooperation mode of innovation are characterized by their strengths in innovation skills and its workforce professionalism. To test this characteristic, we indirectly used the variable referred to the competence activities undertaken by the organization. The results in Table 6.5 show that leading organizations have the highest level of personnel training activities associated to their innovation processes.

Table 5. Average results for personnel training variable

Organizational segment	Personnel training variable average
Leading organizations	4.40
Remaining organizations	2.64
Total sample	2.93

Results suggest that leading organizations partially match the characteristics of organizational-cooperation mode proposed by Tether and Tajar (2008). First, there is a clear tendency from these organizations to orient their innovation processes to

suppliers, customers, universities and research centers. Secondly, it is clear that staff training is a key activity in the development of innovation processes of leading organizations. However, there isn't a marked preference for these organizations towards organizational innovation instead of product, services or processes innovation activities. Consequently, we can say leading organizations show a cooperation mode of innovation we define as "general", without preference for a specific innovation type but oriented to the service value network.

7. Conclusions

As value service creation is always a collaborative and interactive process and service is the fundamental basis of exchange, we propose that analysis of innovation process should be done in the context of the centered service value network. The seven phase's innovation model is presented, which adds phases of leading and co-operating to the five phase's innovation TEMAGUIDE model. In order to identify organizations that carry out the most developed innovation process, we proposed an innovation process development index.

Empirical results indicate applicability and functionality of the seven phase's innovation model. The framework classifies service organizations according to the development level of their innovation processes and identifying existing gaps between them. Applying cluster analysis, we identified a group of five leading organizations characterized by a high degree of organizational leadership involvement through the innovation process, established procedures for ideas selection aligned with strategy, existence of a training and development plan that includes aspects related to support its innovation projects, continuous planning and introduction of new products and services within a long-term plan, as well as resources and talents oriented to the service value network.

Also, leading service organizations show the innovation path called "oriented to the service value network", in which service provider develops its innovation projects involving both service co-producers: suppliers and customers.

The research shows that leading service organizations are engaged in a general cooperation mode of innovation instead of an organizational-cooperation mode. In this mode of innovation, organizations orientate their innovation processes to suppliers, customers, universities and research centers without a preference for a specific type of innovation; also staff training is a key activity.

8. References

- Chiesa, V.; Coughlan, P.; Voss, C. (1996). Development of a Technical Innovation Audit. *Journal of Product Innovation Management*, Vol. 13, N° 2, pp. 105-136.
- Den Hertog, P.; Van der Aa, W.; de Jong, M. (2010). Capabilities for managing service innovation: towards a conceptual framework. *Journal of Service Management*, Vol. 21, N° 4, pp. 490-514.
- Dolan, R. J.; Matthews J. M. (1993). Maximizing the utility of customer product testing: Beta test design and management. *Journal of Product Innovation Management*, Vol. 10, N° 4, pp. 318-330.
- Froehle, C.; Sampson, S. (2006). Foundations and implications of a proposed unified services theory. *Production and Operations Management*, Vol. 15, N° 2, pp. 329-343.
- Fundación COTEC para la Innovación Tecnológica (1999). Pautas metodológicas en gestión de la tecnología y de la innovación para empresas TEMAGUIDE. Tomo 1: Introducción, Presentación, CD y Módulo I: "Perspectiva Empresarial".
- Fundación COTEC para la Innovación Tecnológica (2004). Análisis del proceso de innovación en las empresas de servicio, <http://www.cotec.es>.
- Gadrey, J. (1992). *L' economie des service*, Reperes, La Decouverte, Paris.
- Goffin, K.; Pfeiffer, R. (1999). *Innovation management in UK and German Manufacturing Companies*. Anglo-German Foundation, London.
- IfM and IBM. (2008). *Succeeding through service innovation: A service perspective for education, research, business and government*. University of Cambridge Institute for Manufacturing, Cambridge.
- Karniouchina, E.; Victorino, L.; Verma, R. (2005). Product and Service Innovation: ideas for future cross-disciplinary research. *Journal of Product Innovation Management*, Vol. 23, N° 3, pp. 274-280.
- O'Regan, N.; Ghobadian, A.; Sims, M. (2006). Fast tracking innovation in manufacturing SMEs. *Technovation*, Vol. 26, N° 2, pp. 251-261.
- Robinson, T.; Clarke-Hill, C.; Clarkson, R. (2002). Differentiation through Service: A Perspective from the Commodity Chemicals Sector. *The Service Industries Journal*, Vol. 22, N° 3, pp. 149-166.
- Tether, B.; Tajar, A. (2008). The organisational-cooperation mode of innovation and its prominence amongst European service firms. *Research Policy*, Vol. 37, N° 4, pp. 720-739.
- World Bank (2011). *World development indicators 2011*. Washington DC.