

The 9th CIRP IPSS Conference: Circular Perspectives on Product/Service-Systems

Services Extending Products: a comparative analysis in emerging and developed countries

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Abstract

This paper aims to explore the differences on service infusion, technological turbulence and product extension in companies located in emerging and developed countries. We conducted a survey in Brazilian and Italian companies. The data was analyzed by means of descriptive statistics focusing on the comparison between these two countries. Our preliminary results show that companies from emerging countries seem to suffer lower impact of technological turbulence, while they explore higher levels of service infusion and product extension. Complementarily, companies positioned in developed countries are more related to technological development and are more devoted to a product-centric orientation. At this moment, we cannot affirm if these results are related to companies' capabilities or to market demands, but we propose future studies to go beyond on this subject.

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Peer-review under responsibility of the scientific committee of the 9th CIRP IPSS Conference: Circular Perspectives on Product/Service-Systems.

Keywords: Product extension; Technology turbulence; Service infusion; Emerging and developed countries.

1. Introduction

Servitization is a process by which manufacturing companies reinvent their business model to offer a solution composed by products and services oriented to the customer's needs [1]. More than the extension of the offer's perceived value [2], the adoption of a servitization strategy aims to achieve the adaptability, expandability and customization of products [3]. Consequently, it is expected to retain and offer new products for current customers or even to reach new customers with current products [4].

Since servitization is a strategy oriented to attend customer's needs, contextual factors are relevant in the definition of its suitability. However, although servitization is considered a consolidated topic in the academic literature [5], a remaining challenge is to understand the contextual conditions in which

the servitized offering is introduced and to explore the suitable strategies to operationalize this strategy [6].

The close dependence of servitization on technology favored its emergence in developed countries [7]. Although the servitization strategy has been first diagnosed in developed countries, and have been widely studied in this context [e.g. 7], developing countries have shown characteristics that place them as promising markets for service innovation [8]. This is because servitization helps to intensify the product use, enhancing immaterial consumption and improving resource efficiency [9], which are aspects focused mainly at the base of the pyramid as first proposed by Christensen [10]. These characteristics present in emerging markets also favor the gain of services relative importance to companies as proposed by service infusion theory [5] and demands the utility extension of products thought for developed countries through service adding to satisfy customer's needs [11].

In this sense, we aim at exploring the differences of the emerging and developed countries context regarding technological turbulence, service infusion and product extension performance regarding the adoption of a servitization strategy. For that, a survey was conducted in Italian and Brazilian companies that are facing different levels of service infusion [12,13] and technological turbulence [14].

The approach of servitization by a joint understanding of developing and emerging countries is proposed as an open challenge to validate, diversify and enrich existing research [15, 16]. Different authors have pointed the relevance of the context regarding emerging and developed economies related to the compatibility with the servitized offer [17] and the industry technological level relevance in the context of emerging markets [18]. However, the literature lacks a cross-context comparison approach to understand the servitization phenomena.

2. Theoretical background

Baines *et al.* [1] conceptualizes servitization as the process by which a company transforms its strategy to start offering product service systems (PSS) by adding services to its original products. While adopting a servitization strategy, the company aims on increasing the utility of the product (product extension) [17] through service gain of importance in the company's portfolio (service infusion) [5].

Service innovation, instead of manufacturing innovation, sustainable innovation and innovation for wellbeing, instead of economic productivity and risk are orientations of servitization [19] and are opportunities for innovation in emerging countries and in low tech sectors [20,9]. The weight of product perspective is higher in developed countries due to the maturity achieved by companies in product development skills [21], to the relevance of manufacturing in economy (company size, employment and competitive advantage) [22] and to the product role on technology development pull [23].

2.1. Extended products

Originally, Vandermerwe and Rada [24] associated servitization to the aggregation of goods, services, support, self-service and knowledge to core product offerings. Recent studies on servitization have suggested that "firms may have overextended themselves in moving toward service" [18] and early studies on value chain have predicted the risks of underestimate the manufacturing activity by product-centric companies [25].

Extended products is a product-centric approach that advocate that the product share of the offer is a rigid structure that will be flexibilized by service adding [26]. This definition covers the typical motivations for servitization of manufacturing companies: i) reach new customers with the extant products; ii) facilitate the sales of new products to our current customers; iii) contribute to the continuous improvement of our products; iv) retain customers and to increase their loyalty; v) aggregate value to our customers [4]; and, vi) contribute to the development of new products [27].

2.2. Service infusion

While servitization is known as the change in the business model of a manufacturing company to offer solutions, service infusion is the process of gain of relative importance by service offerings in business strategy [13]. Servitized offers have been placed in an evolutionary continuum between service as "add-on" until tangible goods as "add-on" [28] or in a continuum in which services evolve from oriented to products, passing to a use orientation until it reaches a result orientation [12].

The more the company advances in this continuum the more intense will be the effort to reconfigure the capabilities, structures and resource base of a firm [29]. However, a position of the company more to the right in this continuum does not imply more success [30,31]. As all the innovations, the solution success it is a matter of adequacy to the market's needs [32].

In Kowalkowski *et al.* [5] review on service infusion the measures of number of services offered are proposed as the number of customer to whom services are offered. Also, relative emphasis on services [33] and tangibility and centrality of services in the offer [34] are proposed as measures for the diagnose of service infusion level. In this sense, not only the number of services are relevant, but the service relative quantity regarding products offered (portfolio distribution), the service significance in the market (revenue distribution) and the service orientation (service orientation). The most disseminated classifications of service orientation for servitization were the ones proposed by Tukker [12]: product orientation, use orientation, and result orientation.

2.3. Technological turbulence

In technologically turbulent markets, market orientation loses strength for not being strongly related to business performance [35]. In these contexts, technology push is stronger than market pull and technology orientation advocates a commitment to R&D [23].

Although emerging countries are frequently associated to low tech industries [18], regarding servitization studies, technology is a key factor for service innovation in emerging countries [8]. Emerging markets are considered ideal targets for disruptive technologies and innovations implementation [17] and the diffusion of communication technology is the responsible for putting developing countries on the map to access innovative services [8].

The potential of financial, social and environmental aspects in emerging economies turns it into a market receptive for service offerings [6]. While stronger technological turbulence can stimulate a product centric approach in developed countries [36]. However, the understanding about technology turbulence on competitive advantage through service differentiation by manufacturing companies is still an open subject in the literature [37].

3. Method

Aiming at exploring differences between emerging and developed countries regarding technological turbulence, service infusion and product extension performance, we

adopted a descriptive statistics approach to summarize and describe quantitatively both context [38].

3.1. Sampling and measures

A cross-country survey was conducted in Brazilian and Italian manufacturing companies that are facing different levels of servitization. The questionnaire was submitted to a group of 347 companies from an industrial manufacturing network from Southern Brazil and to 216 companies from an industrial manufacturing network from Italy. We obtained a total of 213 answers (148 Brazilian and 65 Italian). However, for the variables used in this work only 154 were complete questionnaires (response rate of 27.35%). Table 1 details the final sample characteristics.

Table 1. Sample composition (n = 154 companies).

		Italy	Brazil
		61 (40%)	93 (60%)
Main customers	B2B	54 (89%)	69 (74%)
	B2C	7 (11%)	24 (26%)
Companies portfolio distribution	P>S	47 (77%)	69 (74%)
	P=S	1 (2%)	4 (4%)
	P<S	13 (21%)	21 (23%)
Market	Local	19 (31%)	49 (53%)
	Global	42 (69%)	44 (47%)
Companies size	Micro	12 (20%)	10 (11%)
	Small	19 (31%)	20 (21%)
	Medium	14 (23%)	15 (16%)
	Large	16 (26%)	48 (52%)
Sectors	Manufacturing	28 (46%)	37 (40%)
	Services	15 (25%)	25 (27%)
	Metallurgy	12 (20%)	5 (5%)
	Food	2 (3%)	9 (10%)
	IT	2 (3%)	6 (6%)
	Retailing	2 (3%)	4 (4%)
	Construction	0 (0%)	7 (8%)

Product Extension, *Technological Turbulence* and *Service Infusion* were represented by constructs composed by multiple-item scales, while the context was represented by a dichotomous variable regarding emerging (Brazil) and developed (Italy) countries. Since there is little prior research on quantitative aspects on servitization [13], we created new scales based on different suggestions and empirical investigations from the literature.

Product Extension considers the service contribution to the offer flexibilization regarding five items proposed by Gebauer et al. [37], Ordanini and Parasuraman [27] and Raddats et al. [4]: introduction of new products, market expansion, access to new markets, custom loyalty, and product improvement. *Technological Turbulence* considers technological changing rate, the applicability of new technologies to new products offer and changes in the industry regarding the technological evolution [24]. *Service Infusion* regards the distribution of services offered by the company in the continuum proposed by Tukker [12] combined with the relative importance of products and services in the company portfolio and revenue distribution [13].

For each of the items of the *Product Extension* and *Technological Turbulence* constructs, we adopted a crescent five-points Likert scale of agreement. To measure portfolio and revenue distribution, the relation between products and services were categorized by: 1 = only products; 2 = more products than services; 3 = equal distribution of products and services; 4 = less products than services; and, 5 = only services. Service orientation was a variable transformed by the answer of respondents regarding the percentage of product-oriented (multiplied by 1), use-oriented (multiplied by 3) and result-oriented (multiplied by 5) [12] services offered.

3.2. Data validation and analysis

The multiple-item scales were tested through a Confirmatory Factorial Analysis aiming to verify the interdependence between the variables inside each construct [39]. In both cases, the variables fitted in one scale according to the criteria proposed by Rencher [40] of scree plot and retention of components whose eigenvalues are greater than the mean eigenvalues.

For data analysis, a univariate approach was adopted to consider the variables independently aligned with the descriptive and exploratory orientation of this work. Each construct was represented according to the percentage distribution of respondents through levels (Fig. 1). Each item was represented according to the central tendency (median) and dispersion (standard deviation) (Table 2) [38].

The decision limit was calculated to the items that presented difference in the median between countries through the Toker-Kramer test for unbalanced samples. All the items with difference in the medians were significantly different for the threshold alpha = 0,05.

4. Results

Brazil and Italy comparison show differences regarding the relative amount of companies that are placed in higher and lower levels of *Technological Turbulence* and *Service Infusion* and according to the *Product Extension* from the adoption of a servitization strategy (Fig. 1). While Brazilian companies deal with lower levels of *Technological Turbulence* (crescent distribution until level 3), they explore a higher level of *Service Infusion* (level 4) and stand out in higher levels of *Product Extension* (levels 4 and 5). In the case of Italy, companies seem to be operating in high dependence on technological turbulence.

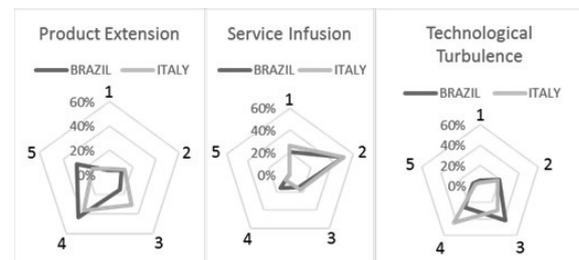


Fig. 1. Distribution of respondents over constructs levels

In Italy, the importance of technological competition can be favoring the trading model based on quality to the detriment of efficiency [36]. This is aligned with an orientation to product quality, compatible with medium to high rates of product extension and lower rates of service infusion explored by a high percentage of Italian companies.

In Brazil, the perception of value is different. Emerging countries based multinationals do not stand on technology as their competitive advantage in the global economy comparing to developed economies companies [41]. While in developed countries companies still perceive as the main sources of value for the customer the product-related aspects [42], in emerging countries, companies can rely on market size and in the privileged access to its customers to have their share in global value chains [41]. This easy access to the customers benefits a strategy with higher service infusion and even to explore products in new forms based on customer's feedback through its extension.

To compare these findings in detail, Table 2 presents the median and the standard deviation (in parentheses) by item for each of the investigated dimensions. This analysis allowed us to deepen the understanding of the differences related to each construct in each context.

Table 2. Items analysis.

Product Extension	Italy	Brazil
Our services allow us to reach new customers with the extant products of our portfolio*	3.4 (1.0)	4.0 (1.2)
Our services help us to retain customers and to increase their loyalty	4.0 (1.2)	4.0 (1.1)
Our services represent an aggregated value to our customers	4.0 (1.0)	4.0 (1.2)
Our services facilitate the sales of new products to our current customers*	3.0 (1.1)	4.0 (1.2)
Our services contribute to the development of new products*	3.0 (1.1)	4.0 (1.2)
Our services contribute to the continuous improvement of our products	3.0 (1.1)	3.0 (1.1)
Service Infusion	Italy	Brazil
Service orientation*	1.9 (1.3)	2.5 (1.3)
Portfolio distribution	2.0 (1.0)	2.0 (1.0)
Revenue distribution	2.0 (1.4)	2.0 (1.4)
Technological Turbulence	Italy	Brazil
In our industry, the technology changes quickly	3.0 (1.3)	3.0 (1.2)
The technology changes enable new opportunities for our industry	4.0 (1.1)	4.0 (1.0)
A big number of ideas for new products were concretized in my industry because of the introduction of new technologies*	4.0 (1.2)	3.4 (1.1)

*Significate difference in the median between countries

4.1. Product extension

Although companies in both countries associate service aggregation to the incensement of customer perceived value over the offer [2] and customer retaining [43], in this matter, the differences between the two contexts are associated with reaching new customers with current products and with the development, improvement and marketability of products to current customers.

The first item (reach new customers with current products through service adding) is a practice operationalized on circular economy through product use intensification and is deeply

applied to emerging economies as product sharing and pay-per-use [9]. Besides, the search for cost reduction through commoditization of products demands flexibilization to reach new markets. One example are multinational companies that centralize its design centers in developed countries and requires the tropicalization of its products to be competitive in emerging economies.

Although we cannot affirm that product extension in these different contexts is associated to an ability or a need of product flexibilization at this point, its higher compatibility with emerging countries context is suggested. But, once extended products are defined as “a physical product extended by services aiming at the provision of a customer oriented solution” [44] we suggest that this occur because of the lack of control of emerging economies companies over the product design [21] and for their proximity with the users [41].

Regarding services as inputs for product development, improvement and/or marketability, we support on the unified services theory that declares that a service will occur from at least one input of the customer [45]. From this our results advocate in favor of customer-orientation for the offer's success and reinforce the role of emerging countries as source of service innovation knowledge [8] due to their proximity to customers [41].

4.2. Service infusion

Although the majority of companies investigated in both contexts still are aiming to offer predominantly products in detriment of services in the portfolio and revenue distribution (Table 2), in terms of service orientation, Brazilian companies have advanced further in the continuum of service orientation. Table 2 shows that, by the analysis of the construct items, services are more oriented to use and result in Brazilian companies than in Italian's. In this sense, we could say that Italian companies are worried on providing ownership for their customers and Brazilian companies in offering functionalities.

This proposition is aligned with the PSS typology proposed by Androdegari *et al.* [42] of: i) ownership oriented: product-focused and product and process-focused; and, ii) service oriented: access-focused, use-focused and outcome-focused. This study also finds out that, in developed economies, “the adoption of service-oriented business models is low in particular in the sectors addressed by the project, namely: machinery, transportation and automation” [42], which suggests a dependence on the companies' sectors.

Complementarily, some strategies that can be observed in multinational companies that aim at entering the Brazilian market has been observed in other studies on servitization is the change of the product position in the value chain [46]. For example, a product that is sold in Germany for the final user (B2C) started to be sold for service providers (B2B) that would sell the result for the final user, for whom the high price and quality of the product was justifiable for the intention of high usage. In this case, the Brazilian unit of the company started to operate in a demand chain management approach [47].

However, both contexts still present low levels of service infusion according to the median of values observed. This could mean that servitization strategies are not reaching the full

potential expected [48] or merely that not all manufacturing companies should aim at high service infusion levels to achieve a better performance [13].

4.3. Technological turbulence

The results show an equivalent level of *Technological Turbulence* for both contexts because the agreement with the statements “In our industry, the technology changes quickly” and “The technology changes enable new opportunities for our industry” are at similar levels according to the median values and vary little among them regarding the standard deviation. However, the application of new technologies for new products seems to be more compatible with the median values of companies in the Italian context.

Italian companies historically have had their capacity for product innovation related to their trade competitiveness in global markets [49,36]. Sectors with intense design and engineering activities and higher percentage of product innovativeness have also been related to increasing employment due to technological change in the Italian context [22].

Even though Brazilian companies have shown a high agreement to the implementation of new technologies in new products, it was significantly lower than the agreement of occurrence in Italian companies. It is a reality that some emerging countries are earning their space on technological innovation, but there is still a gap between them and developed countries in this matter [50].

A possible explanation to these findings is that technological capabilities (utilization, compilation, acquisition and generation) are distributed in companies in developed and developing countries [51]. While emerging countries import technology and learn to manage the activities of utilization, compilation and acquisition, developed countries companies became focused on technology generation. In the case of global corporations, developed countries retain the activities of product and technology development and outsource the basic segment of manufacturing to emerging countries [21].

5. Conclusion

In this paper, we presented an exploratory study of the differences regarding product extension, service infusion and technological turbulence in companies located in emerging and developed countries. From the results obtained in this study, we can expect that: i) developed countries are more susceptible to technological turbulence that can be related to a stronger product-orientation strategy; and ii) emerging countries companies reach higher levels of product extension through service infusion due to its lack of control over product development activities and to its proximity with customers.

To be able to generalize results it should be necessary to conduct inferential or inductive statistical analysis [20] and expand the scope of analysis for other countries that should be representative of emerging and developed economies. Although the majority of Italian employees are in the manufacturing industry, as in other developed economies, Italy

presented the lower rates of recent service industries employment regarding G7 countries [52].

As a suggestion for future studies we propose the verification of the effect of the technological turbulence and service infusion in contexts with different economic development levels as so as its cross-effect in the product extension capacity. Complementarily, we propose the investigation of the impact of the industrial sector, company size, market and customers type as control variables. Although samples have similar distributions regarding customers attended and portfolio distribution, Italian selected companies are positioned mostly in global markets, what could be reinforcing its dependence on technological turbulence and its product orientation. While Brazilian companies in the sample are majority acting in local markets, what favors service provision.

Acknowledgements

The authors thank to the Brazilian Education Ministry (CAPES) and to the Brazilian National Council for Scientific and Technological Development (CNPq) for the financial support received to conduct this research scholarships.

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