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Product or process innovation? The dilemma for exporting SMEs in emerging economies: the case of the Colombian Caribbean

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Abstract

On the path to economic globalisation, companies are constantly facing opportunities and challenges in their pursuit of business survival and continuous improvement. Due to its strategic conception, innovation management seems to generate the transformations required in the current competitive environment. This article seeks to analyse the dilemma faced by small and medium sized exporting enterprises located in a developing country and regarding what to manage first: product or process innovation. The empirical analysis has been performed in the Colombian Caribbean region. The results revealed that companies focus more on process innovation than on product innovation. Similarly, it is concluded that the former precedes the latter.

Keywords: Product innovation; process innovation; exporting SMEs; innovation activities; competitive advantage.

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1. Introduction

Innovation has become a necessity in the current competitive context for companies to the point that no company can survive without it. However, in terms of innovation strategies, managers are often alone in deciding which types of innovation to pursue, how to balance them in an overall portfolio, and how to allocate and implement resources [1-4]. Exporting companies, especially small- and medium-sized enterprises (SMEs), make many decisions, among which the most important is whether to innovate in products or processes, while considering vital limitations such as resources, time, and a high level of competition in their market niche. Product innovation is the key to organisational renewal and success. It should lead to higher organisational performance [5], while the most important factor to boost process innovation capability is collaborations with research organisations, suppliers, and absorptive capacity

The dilemma in question has been addressed in business literature by several authors [6]–[9], demonstrating that a highly competitive environment is positively related to the joint implementation of the product and process innovation strategies. Similarly, other studies have concluded that companies should focus more on developing new processes or business systems to enter the market in competitive environments [10], [11].

The literature points out that company size is one of the primary limitations in their orientation towards international markets [3], [12], [13].

Study contextualization

In Colombia, SMEs represent more than 90% of businesses, account for 35% of the gross domestic product, and generate approximately 80% of employment. On the contrary, SMEs in the Colombian Caribbean region account for nearly 10% of the country's total SMEs and make sales amounting to close to US$7.8 billion, i.e., 37.2% of the country's total exports. The export offer of the region primarily comprises minerals, oils, vegetables, animals, bituminous materials (52%), iron and steel and products thereof (16%), plastic and products thereof (10%), chemical products, fertilisers and pesticides, pharmaceuticals and medicines (8%), and others with 14% [14].

According to Lechuga et al. [15], exporting SMEs in the Colombian Caribbean region are not oblivious to the dilemma of where to direct their innovative efforts in terms of internationalisation and the fact that they may encounter many difficulties when facing this challenge due to the scarcity of economic, technical, or human resources. Likewise, Mesa and Torres [16] identified that, unlike large companies that have more appropriate professional schemes to access foreign markets, SMEs are highly dependent on the management capacity of their owners. Business limitations, high risk aversion, and limited knowledge of opportunities in foreign markets reduce the ability of these companies to carry out international operations

Prasanna et al. [17] [11] demonstrates that the field of innovation studies is a multidisciplinary field that has emerged mainly due to the confluence of different social sciences, with a leading role in economic studies of technological change in the growth or development of a firm, region, or country. Many authors consider innovation as the trigger factor in improving the competitiveness of companies and the economic development of nations through a significant increase in the speed and effect of competitive response .

Product innovation corresponds assertively to the introduction of a new good or service, or a significantly improved one in terms of its characteristics or intended use, through which significant improvements are included in technical characteristics, components, materials, ease of use, or other functional characteristics. Regarding process innovation, the adoption of new or significant developments related to production forms, the definition of methods and procedures, and functional structures that support production innovation are promoted, as well as the adoption of changes in which equipment and technologies that support the development of the production organisation or processes Methods and measures.

The analysed data come from the application of a structured questionnaire with 34 questions addressing management personnel related to the innovation management of the 65 exporting SMEs in the Colombian Caribbean region that took part in the study. The primary economic sectors of these companies are chemicals, fertilisers and pesticides, pharmaceuticals and medicine, plastics and articles thereof, iron and steel and articles thereof, minerals, oils, vegetables and animals, and bituminous materials [14].

2. Results and discussion

When examining the relationships between product and process innovation indicators, Spearman's correlation coefficients are used as they are not sensitive to the assumption of data normality. The relationships between the process and product innovation indicators are obvious, since there are statistically significant association measures and several above 0.5, which is the reference of a median to strong relationship between pairs of variables, from a descriptive perspective; see Table 1.

Table 1. Spearman's Correlation Matrix

		IPR1	IPR2	IPR3	IPR4	IPR5	IPR6	IPR7	IPR8
Product innovation	IP1	0.285*	0.449**	0.162	0.396**	0.547**	0.375**	0.643**	0.618**
	IP2	0.395**	0.370**	0.326*	0.285*	0.182	0.207	0.248	0.233
	IP3	0.020	0.492**	0.237	0.269*	0.515**	0.553**	0.136	0.658**
	IP4	0.258	0.286*	0.438**	0.446**	0.103	0.244	0.198	0.520**
	IP5	0.310*	0.131	0.606**	0.711**	0.177	0.165	0.257	0.372**
	IP6	0.053	0.289*	−0.052	−0.169	0.221	0.294*	0.017	0.321*
	IP7	−0.085	0.033	0.131	0.139	0.400**	0.399**	−0.087	0.230
	IP8	0.219	0.169	0.474**	0.281*	0.353**	0.573**	−0.080	0.469**

Conventions:

*. The correlation is significant at the 0.05 level (2-tailed).

**. The correlation is significant at the 0.01 level (2-tailed).

IP1: The organisation introduced new products to the market; IP2: The organisation significantly improved the products offered to the market.; IP3: The organisation develops customer surveys to determine new uses for the product.; IP4: The organisation significantly improved the technical characteristics of its products; IP5: The organisation significantly improved the functional characteristics of its products.; IP6: The policies are oriented toward the generation of knowledge through automated processes and procedures; IP7: There are management strategies that allow the identification and use of new and existing substitute technologies; IP8: The organisation significantly improved and updated the existing technology; IPR1: The SME implemented new or substantially improved business practices to increase the efficiency of information systems, production, and logistics; IPR2: The SME implemented new or substantially improved business practices to improve the effectiveness of distribution systems.; IPR3: The organisation implemented a new or significantly improved process, technique, equipment, or software to improve production; IPR4: The SME implemented new or substantially improved practices related to business process reengineering and total quality management; IPR5: The organisation implemented a significant and improved distribution method; IPR6: The organisation implemented a new method of logistics, delivery, or distribution of goods.; IPR7: The organisation implemented a new production method.; IPR8: The organisation implemented a significant and improved production method.

The introduction of new products to the market (IP1) has a significant correlation (0.547) with the implementation of a significant and improved distribution method (IPR5), as well as a new (0.643) and improved (0.618) production method (IPR7 and IPR8). Something similar occurs between companies developing customer surveys to determine new uses of the product with the implementation of a significant and improved distribution method (0.515), a new logistics method (0.553), and a significant and improved production method (0.658). Furthermore, there is a strong association between the significant improvement of the product's functional characteristics (IP5) with the implementation of a new or significantly improved process, technique, equipment, or computer programme (0.606); this is in addition to new or substantially improved practices related to business process reengineering (BPR) and total quality management (TQM) (0.711). In this last strong association, we can infer that the innovation capability on the product's functional characteristics (IP5) is a dynamic capability that allows the organisation to remain aligned with the customer's needs in an increasingly dynamic and fast environment. In both new product innovation processes (IP1) and functional characteristics (IP5), small manufacturing companies use the theory of organisational effectiveness, employing realisation logic and creatively using available resources, specifically based on their

knowledge of their customers and the market, by applying customer surveys to determine new uses for the product (IP5) .This reveals that process innovation significantly improves market performance.

These findings demonstrate that the implementation of a significant and improved production method mostly affects the innovation process. In the case of process innovation capability, collaboration with research organisations and suppliers is the most important factor. It is here where the strategic relationships with suppliers are fundamental in exporting SMEs and the reasons behind this can be explained; therefore, collaborative network constructions with suppliers are significant and highly value-generating. When an organisation encounters minimal financial barriers, it allocates greater resources to product and process innovation to significantly improve market performance.

Table 2. Estimates of the Product Innovation Model as a Function of Process Innovation

	Standardised Coefficients		Unstandardised Coefficients			95.0% Confidence Interval for B	
	B	Std. Error	Beta	t	P-value	Lower Bound	Upper Bound
(Constant)	1.917	0.204	0.000	9.408	0.000	1.508	2.326
IPR8	0.272	0.045	0.544	6.001	0.000	0.181	0.364
IPR4	0.141	0.045	0.267	3.131	0.003	0.051	0.231
IPR2	0.129	0.052	0.216	2.483	0.016	0.025	0.233

Source: Prepared by the authors

IPRO8: The organisation implemented a significant and improved production method.
IPRO4: The SME implemented new or significantly improved practices related to BPR and TQM.
IPRO2: The SME implemented new or significantly improved practices to improve the efficiency of the distribution systems.

3.1. Factor analysis

Since the identification and assimilation phases are measured by a set of items, in the first case the cooperation between companies and in the second case the different human resources practices, a factor analysis is initially performed —a data reduction method that seeks to extract a set of factors from a group of variables that explain the covariance between them. This procedure is applied to determine whether all the variables correctly measure each phase. For this analysis, all the ordinal and continuous variables were initially included, with a Kaiser-Meyer-Olkin (KMO) measure = 0.215, which showed that it is not feasible to continue with the analysis taking into account all these variables; therefore, the procedure was divided and performed for ordinal and continuous variables separately. Table 3 presents the KMO and Bartlett's test, indicating that the factor analysis is feasible and can be performed, since KMO = 0.700. Moreover, the p-value (Sig.) of Bartlett's test of sphericity shows that the factor analysis can be continued in addition to the Chi-Square value on which the test and the degrees of freedom (df) are based. However, it is used only as a reference term and what should instead be interpreted is its significance (p-value).

Table 3. KMO and Bartlett's Test

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy		0.7
Bartlett's Test of Sphericity	Approx. Chi-square	505.173
	Df	91
	Sig.	0

Source: Prepared by the authors

Table 3 shows the extraction sums of squared loadings in which the eigenvalues greater than 1, the percentage of variance, and the cumulative percentage are indicated. In this case, this column corresponds to the unrotated factor solution; therefore, the second column is analysed, i.e., the rotation sums of squared loadings. First, the results revealed that the procedure extracted four (4) components that explain 73.52% of the total variance. Component 1 explains

22.60%, the second 22.42%, the third 19.72%, and the last 8.76%. This analysis indicates that all the instrument variables were reduced to four main factors, included in Table 4.

Table 4. Total Variance Explained

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.753	41.092	41.092	3.165	22.606	22.606
2	1.998	14.272	55.364	3.139	22.421	45.027
3	1.51	10.783	66.147	2.762	19.726	64.753
4	1.032	7.374	73.521	1.228	8.769	73.521

Extraction Method: Principal Component Analysis (PCA).

Source: Prepared by the authors

The rotated component matrix (see Table 5) shows the four components and the correlation coefficients associated with each question of the instrument and, in turn, the factors' suggested name.

Table 5. Rotated Component Matrix

Component Name	**Variables**	**Component**			
		1	**2**	**3**	**4**
Market orientation	-New production method implemented	0.863			
	-New products introduced to market	0.854			
	-New or significantly improved practices in distribution systems	0.657			
	-Significantly improved products offered to the market	0.639			
Orientation toward distribution technology and logistics	-Significant and improved distribution method implemented		0.832		
	-New logistics, delivery, or distribution of goods method implemented		0.823		
	-Management strategies defined to identify and use new substitute technologies		0.716		
	-Technology improved and updated		0.647		
Orientation toward product and process development	-Product´s technical characteristics improved			0.885	
	-Product's functional characteristics improved			0.858	
	-New or significantly improved practices related to processing total and quality management			0.551	
	-Improved practices related to business process reengineering (BPR) and total quality management (TQM)			0.536	
	-Improved production method implemented			0.526	
Orientation toward Information Management (IM)	-Periodic customer surveys aiming to determine new uses for the product				0.674
	-New or significantly improved business practices to increase the efficiency of information, production, and logistics systems				−0.602

Source: Prepared by the authors

3.2. Results of continuous variables

The KMO test shows that there are strong correlations between the variables and the Bartlett's test that are grounds to start the factor analysis process. The ordinal variables that measured agreement and disagreement were grouped into four main components that account for 73.52% of the total variance. The first component is market orientation based on the implementation of production methods, new product development, the strengthening of existing products, and the improvement of distribution systems. The second is directed at technology and logistics, grouping together distribution methods, logistics, and technology elements. The third component corresponds to product and process

development and is based on promoting improvements in products' technical and functional characteristics, namely BPR, TQM, and production methods. This component could also be related to research and innovation issues.

3. Conclusions

The importance of employment generation and economic growth in exporting SMEs in the Colombian Caribbean region is evident, and their competitive sphere is focused on increasing their levels of productivity and competitiveness that support product or process innovation. The analysis of the dilemma of product or process innovation presented in the exporting SMEs of the Colombian Caribbean region allows us to conclude that from the socio-economic perspective, innovation management promotes vital transformations that affect new approaches on how to conceive products or processes. The results of the correlational study indicated that process innovation precedes product innovation; similarly, process innovation relies on dominant aspects such as logistics, distribution systems, the implementation of production methods, and the adoption of technologies. In the same way, theoretically, the interactions with suppliers and alliances with external entities that allow support and assistance to achieve technology transfers, knowledge, and experience serve as a basis for the dynamization of product innovation.

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