Contextualisation Method for Measuring the Degree of Innovation in Micro and Small Enterprises

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Abstract

The methodologies proposed for measuring the degree of corporate innovation require a relevant selection of indicators. Nowadays, there is a growing number of indicators that can be used to describe innovation management and measure the degree of innovation. However, these indicators only provide a partial outlook of the degree of innovation, being often incomplete. Therefore, it is important to create compound indexes comprising different indicators, weighting factors and coefficients able to contextualise the conditions and characteristics of the elements analysed. This enables an assessment of the importance of contextualising indicators for measuring the degree of innovation based on the influence of different weighting factors and coefficients directly related to the context analysed. In this regard, the present work was aimed at contextualising the tool used for measuring the impact of innovation – INOVA-tec – and draw a comparison with the Innovation Radar for measuring the degree of innovation of a Micro and Small Enterprise (MSE). In addition, the present work developed a new methodological approach focused on contextualising the process for measuring the degree of innovation of business organisations based on the analysis of two MSEs. Both methodologies were applied for the measurement of the degree of innovation of 2 different retail companies from the textile and clothing sector. The results obtained concluded that the adapted version of INOVA-tec allows to contextualise the process of measuring the degree of innovation in MSEs by considering different perspectives and particularities taking into account the context of the companies analysed and the innovation actions implemented. Moreover, it enabled to assess the relevance of the indicators with regards to the value chain or type of service provided, considering different time frames and geographical scopes of the actions and their respective impacts. The adapted version of INOVA-tec also provides a greater range of analysis of the results, with a wider scope of categories which are directly proportional to the weighting criteria, weight ranges and correction factors adopted in the indicators considered. The Innovation Radar, which provided a contextualisation of the indicators analysed, showed an overlap of the degree of innovation between the different profiles of business innovation.

Keywords: innovation; INOVA-tec; Innovation Radar.

1. Introduction

As a result of the extraordinary changes that have taken place worldwide, innovation has become a fundamental requirement for small, medium or large enterprises from various economic sectors. Therefore, it is no longer enough to offer high-quality goods and services to customers. Many companies which used to produce goods and offer high-quality services remained wedged in the past as a result of the lack of innovation, being overtaken by companies that boast unique products and services (SILVA et al., 2008).

The innovation process of goods and processes can be defined by the act of producing new products or processes, or even simply the improvement of existing goods or processes. Moreover, they should be introduced in a specific market or used throughout processes or productive workflows, aiming at generating new products or boosting existing ones. To be considered technologically innovative, a certain good or process does not necessarily require uniqueness, although it should be unprecedented within the enterprise to which it is inserted in (OECD, 2004).

Innovation is the main agent of change in today's world, with innovation granting various competitive advantages to companies, also leading to economic growth and a more sustainable development. Companies from any sector require constant innovation in order to ensure growth, competitiveness and success (MARTIN; NAMUSONGE, 2014).

The importance of innovation as a factor for economic growth or a certain organisation has been acknowledged in various researches present in the literature, which have shown that innovation is able to incorporate new high-quality products and services aiming at a reduction in the price of the goods offered to society. This allows taking over new customers and expanding production (CAVALCANTI et al., 2015). Moreover, Martin and Namusonge (2014) and Silva et al (2008) verified the direct relationship between the level of innovation and profitability of companies analysed as part of their studies.

The contemporary corporate world is full of innovative actions which constantly emerge. Companies from almost all economic sectors are faced with new products, as well as novel processes and services which are created and deployed in the consumer market at an unprecedented speed (SILVA, 2008). In this regard, most innovative companies experience a greater turnover of products and services introduced within a certain period of time (MARTIN; NAMUSONGE, 2014).

Therefore, innovation is a process which grants a certain advantage to companies when compared with their competitors, by reducing costs from improving processes, increasing productivity, distinct marketing strategies, new forms of relationship with customers, among other improvements (OECD, 2004).

In this regard, innovation management provides greater market viability, even enabling to reduce the time between launching a given product and the effective return of investment (JESUS, 2011).

Within the context of sustainable development, Cavalcanti et al. (2015) pointed out that innovation must be based on decisions supported by policies and processes which are reliable, transient and boasting appropriate metrics. However, the greatest drawback of innovation management is associated to the lack of metrics capable of providing information related to the best innovation investment options, or the absence of an assessment of the actions that should be promoted to boost the development of an organisation. For companies to boom, they must be supported by an innovative approach which grants them a competitive advantage in their predominant business environment (MARTIN; NAMUSONGE, 2014).

The search for innovation indexes to analyse companies requires an initial selection and an appropriate assessment of existing indicators. Nowadays, there is a growing number of indicators which can be used to describe an innovative process, enabling to capture relevant aspects of this process. Nonetheless, these indicators often partially descriptive or even incomplete, thus justifying the development of compound indexes consisting of several indicators (FURTADO; QUEIROZ, 2007).

According to Furtado and Queiroz (2007), innovation indicators can be subdivided into those that measure inputs or efforts, and into those that measure products or the results of innovation. On the other hand, Bachmann and Destefani (2008) consider that the indicators traditionally used to measure the level of innovation in organisations, such as the "number of patents" and "R&D expenditure", are not entirely applicable to micro and small enterprises (MSEs). According to the authors, "although financial metrics are relevant to the corporate world and possibly the best form of assessing both the strain and benefits of innovation processes, this approach was considered incompatible within the context of MSEs".

In this regard, the measurement of a company's level of innovation is based on issues originating from different dimensions and scope. These require the use of diagnostic tools, monitoring and support to decision-making in MSEs, capable of analysing and reflecting on certain peculiarities related to the specific context of MSEs.

With this in mind, this work was aimed at contextualising the INOVA-tec measurement tool on the impact of innovation. Moreover, this measurement tool was compared with the Innovation Radar on the measurement of the degree of innovation in MSEs, aiming at developing a methodological approach focused on the contextualisation of the measurement of the degree of innovation in business organisations, taking into account the analysis of MSEs.

2. Contextualisation of indicators for measuring a company's degree of innovation

Innovation is a wide concept consisting of various scopes and dimensions. Therefore, measuring innovation in terms of performance is not straightforward (CAVALCANTI et al., 2015). The level of innovation of a certain company can be measured using several indicators. The wide range of indicators available in the literature allows that corporate innovation can be measured through different perspectives, under a strategic, cultural, financial, procedural point of view, among others. Nevertheless, a company's classification as innovative is not based on the sum of resources invested in innovation. An inherently innovative company is capable of adding greater value to its customers, with its abilities being consequently used as a reference basis when drawing a comparison with their competitors. Several factors influence the innovative culture of an organisation, being considered as either internal or external factors (NASCIMENTO, 2009).

According to Figueiredo (2005), it is important to identify whether the innovation capacity of a certain company is present, although it is also necessary to verify its direction, extension – or level – and speed. In this regard, it is important to take into account the fundamental principle of management, which enables an effective management of what is measurable. However, before introducing such metric in this context, it is important to consider the drawbacks of the conventional innovation indicators.

Although the four fundamental types of innovation are summarised into product, process, marketing and organisational innovation (OCDE, 2004), these can be further classified into subtypes, providing a more

detailed view of innovation. This more detailed perspective is considered under the tool denominated Innovation Radar, which considers between twelve and thirteen different key innovation dimensions (SAWHNEY et al., 2006; BACHMANN; DESTEFANI, 2008; MATTOS et al., 2010).

An enhancement of the process of measuring innovation can be aimed at overcoming linearities and considering more criteria in the score of indicators and dimensions. Therefore, the allocation of new criteria can lead to a more complex analysis, although being much more detailed and consistent within the given context. In this regard, the INOVA-tec tool enables a more thorough assessment of corporate innovation level, by applying different weighting factors, coefficients and scopes. The tool considers, for instance, inherent aspects to the chain in which the company is inserted in or the time frame of actions.

It is important to note that some companies do not have financial availability to pay for royalties for novel patents, know-how or external expertise. While other companies do have this financial availability, there is no eagerness for preparing the company for this action. Finally, there are also companies which are implementing actions for gathering the resources necessary to fund such royalties, know-how or external expertise. These three cases require considering different weighting factors, coefficients or correction factors for the appropriate indicators.

The implementation of technical standards and certifications is another example of an indicator which could lead to the application of different weights and scopes, taking into account the size, value chain, available resources and the environment where the company is inserted in. Certain companies follow technical guidelines which can be duly documented and updated. However, they do not have the financial resources to afford any advisory service aimed at preparing the company for such certifications. Therefore, as previously pointed out, different coefficients and corrections factors also have to be considered when attributing the score to this indicator.

In this regard, some aspects related to waste management and reuse can also consider different weighting coefficients as a result of the value chain to which the company is inserted in. For example, a company inserted in the food and beverage sectors will have greater opportunities for recycling waste, even generating extra profit from a reuse system, when compared to IT consulting firms, which tend to have a significantly lower volume of waste recycled.

Therefore, the compilation of data for measuring the level of innovation of MSEs can be more thorough than in the approach considered by Sawhney et al. (2006), who represented the level of business innovation by taking into account the average score of the indicators present in all dimensions analysed. These dimensions consist of almost the same coefficients, though without considering intrinsic and extrinsic aspects of companies, such as their size, the time frame, the value chain, the availability of external and internal resources, corporate behaviour, socioeconomic aspects of the region where the company is located in, or even the political, institutional and regulatory context, among other aspects.

The adaption of the INOVA-tec tool for measuring the level of innovation in MSEs enables to offer a new approach for handling the indicators presented in the Innovation Radar. This new approach is based on attributing new weighting coefficients, score ranges and correction factors which are related to the importance of the indicators in each context analysed.

This contextualisation approach for measuring innovation in MSEs was initally briefly presented by Souza and Silva (2020). With this in mind, the present work aims at describing in further detail the design and

respective coefficient, score range and correction factors referring to the development of this contextualisation process for measuring innovation in MSEs.

3. Innovation Radar

The Innovation Radar was initially proposed by Sawhney et al. (2006) and adapted by Bachmann and Destefani (2008). It is a methodological tool developed for measuring innovation by analysing 13 different dimensions related to the process of Innovation Management.

At first, this tool considered the following key dimensions: offerings, platform, brand, customers, solutions, relationship, value capture, processes, organisation, supply chain, presence and networking. Bachmann and Destefani (2008) subsequently included the innovative ambience, being attributed a weighting factor of 2 for its indicators – the only indicator with a distinct weighting factor. The level of innovation considered from the application of this method ranks a company as "Systemic Innovator", "Occasional Innovator" and "Little or not Innovative". These ranks and their respective scores are presented in Chart 1.

Chart 1. Classification of MSEs according to the scores of the degree of innovation

Type of company	Definition	Score of the Degree of Innovation
Systemic Innovator	A company that practices innovation management systematically	Equal or higher than 4
Occasional Innovator	The firm has innovated in the last 3 years, though it is not a systematic process	Equal or higher than 3 and below 4
Little or not Innovative	The company innovates little or does not innovate at all.	Equal or higher than 1 and lower than 3

Source: Néto (2012); Bachmann and Destefani (2008).

Chart 2 presents the dimensions, indicators, scores and weighting factors considered in the Innovation Radar tool, as proposed by Bachmann and Destefani (2008). The degree of innovation obtained with the application of this tool is obtained by the average score of each dimension, taking into account the respective scores of the indicators and their weighting factors (Bachmann; Destefani, 2008).

Chart 2. Dimensions, indicators, score and weight of indicators presented by the Innovation Radar tool.

Dimension	Indicators	Score	Score of the Indicator
A - Offering	- Products - Daring	1, 3 or 5	1 1
B - Platform	- Production System	1, 3 or 5	1
C - Brand	- Brand - Brand leverage	1, 3 or 5	1 1
D - Customers	- Identification of needs - Identification of markets	1, 3 or 5	1 1

	- Use of customers' expressions		1
E - Solutions	- Complementary solutions - Resource integration	1, 3 or 5	1 1
F – Relationship	- Facilities and amenities - Computerisation	1, 3 or 5	1 1
G – Value capture	- Use of existing resources - Use of opportunities for interaction	1, 3 or 5	1 1
H - Processes	- Process improvement - Management systems - Certifications - Management software - Environmental aspects - Waste management	1, 3 or 5	1 1 1 1 1 1
I - Organisation	- Reorganisation - Partnerships - External vision - Competitive strategy	1, 3 or 5	1 1 1 1
J – Supply Chain	- Supply chain	1, 3 or 5	1 1
K - Presence	- Points of sale - New markets	1, 3 or 5	1 1
L - Networking	- Dialogue with the customer	1, 3 or 5	1
M – Innovative Ambience	- External sources of knowledge I - External sources of knowledge II - External sources of knowledge III - External sources of knowledge IV - Technological daring - Innovative funding - Collections of ideas	1, 3 or 5	2 2 2 2 2 2 2
Degree of Innovation	= (Σ (Total score of dimension A / number of indicators A), (Total score of dimension B/number of indicators B), ... (Total score of dimension M/number of indicators M)) / (number of dimensions analysed)		

Source: Néto (2012); Bachmann and Destefani (2008).

Néto and Teixeira (2011) described the aspects related to the dimensions which represent the Radar of Innovation and its respective indicators, which are pointed out below:

- Offering – This dimension considers the offer of new opportunities and its results related to the implementation of new products/services. The following variables are considered: (a) new markets; (b) new products; (c) daring; (d) answer to the environment; (e) design; and (f) technological innovation.
- Platform – Analyses the company's ability of using pre-existing infrastructure resources to offer different products/services. The following indicators are taken into account: (a) production system; and (b) product versions.
- Brand – Considers the opportunities associated to the investments made in order to improving results by taking advantage of the brand to also leverage other business opportunities or using other businesses

to value the brand. Trademark also indicates the company's innovative potential. The following indicators are considered: (a) brand protection; and (b) brand leverage.

- Customers – Identifies the customers' needs, customers' suggestions and new markets, with the use of this information contributing to strengthen the company's competitiveness. The following indicators are considered: (a) identification of needs; (b) identification of markets; (c) use of customers' expressions – processes; and (d) use of customers' expressions – results.
- Solutions – Considers the importance of customised and integration combination of goods, services and information that contribute to solve customers' problems. It also involves the offer of some complementary product/service to the public, creating new revenue opportunities. The following variables are considered: (a) complementary solutions; and (b) resource integration.
- Relationship – Considers the importance of implementing easy-access facilities to customers. The following indicators are taken into account: (a) facilities and amenities; and (b) computerisation.
- Value capture – Considers the importance of adopting new forms of management to generate revenues from the analysis of information of interaction with customers, suppliers and partners. The following indicators are considered: (a) use of existing resources; and (b) use of opportunities for interaction.
- Processes – Use of modern administration methods and instruments, such as certifications, management practices or change of procedures to achieve higher efficiency, quality, flexibility, shorter production cycle or benefits for third parties. For the calculation, the following variables are considered: (a) process improvement; (b) management systems; (c) certifications; (d) management software; (e) environmental aspects; and (f) waste management.
- Organisation – Analyses the way the company is structured, the partnerships established, as well as the methods for reorganising responsibilities. The following variables are taken into account: (a) reorganisation; (b) partnership; (c) external vision; and (d) competitive strategy.
- Supply chain – Considers the importance of assessing logistical aspects of the business, such as transportation, storage and delivery. The following indicator is established: (a) supply chain.
- Presence – Considers the importance of analysing aspects related to distribution channels that the company uses to place its products/services in the market, as well as places where these items can be purchased by consumers. The following indicators are considered: (a) points of sale; and (b) new markets.
- Network – Assesses the importance of assessing aspects related to the network that connects the company and its products/services to the customer. The following indicator is taken into account: (a) dialogue with the customer.
- Innovative ambience – This dimension considers the importance of how innovative actions are stimulated through the use of information originating from external or internal sources or knowledge. The following indicators are taken into account: (a) external sources of knowledge I; (b external sources of knowledge II; (c) external sources of knowledge III; (d) external sources of knowledge IV; (e) intellectual property; (f) innovative daring; (g) innovative funding; and (h) collection of ideas.

According to Carvalho et al. (2015), the Innovation Radar has the potential of contributing to a greater competitive advantage. This tool points out which of the company's dimensions have been innovative, while also flagging which dimensions are not well explored, being important to distinguish a company within the market in which it is inserted in.

4. INOVA-Tec

The INOVA-tec tool (JESUS, 2011; JESUS, 2007) is a methodology for measuring the degree of technological innovation. It provides different score criteria to indicators from different dimensions, establishing the overall degree of innovation.

INOVA-tec presents a spreadsheet which organises the indicators and dimensions, enabling the user to consider different levels of importance or magnitude of the parameters (JESUS, 2011). With this approach, innovation is measured through a more detailed approach, which enables greater contextualisation of the level of innovation.

The spreadsheet for evaluating the indicators carries out an analysis of the different dimensions (social, environmental, economic, institutional development, qualification, introduction to technology and unexpected incidents) which can suffer from the impacts of innovations, besides those dimensions inserted by an evaluator. These are essential, as they present specific indicators which are relevant to research and innovation. The method allows the evaluator to analyse the indicators considered relevant, taking into account different weighting factors and correlation factors linked to the evaluation context. The assessment of the given indicators and dimensions generates the Magnitude Index (JESUS, 2011; JESUS, 2007).

The INOVA-tec system is able to normalise the weighting factors, though without prioritising any dimensions. For each indicator presented, the system returns weights ranging from 1 to 3 for the indicators, within a range from -2 to +2. In turn, the correction factors have a wider range, varying from +1 to +5. The range of weighting factors establishes that indicators with a higher weight present a magnified impact. In case a given indicator is not significant to represent the level of innovation under analysis, this indicator can be ignored. Moreover, new relevant indicators can be inserted within the dimension of "Specific Indicators" (JESUS, 2011; JESUS, 2007).

Therefore, the Magnitude Index is calculated following the identification of the weighting factors, weight range and correction factors of the score of indicators, as well as gathering the relevant data. The Magnitude Index is calculated according to the following equations:

i) Equation 01: Indicator Score $_{a,g}$ x Weight of Indicator $_{a,g}$ x Value of Weight Range $_{a,g}$ + Σ (Correction Factor $_{a,g}$) = Total Weight of Indicator from the given dimension $_{a,g}$

ii) Equation 02: Total weight of the given dimension $_{a,g}$ = Σ (Total weight of Indicators from the given dimension $_{a,g}$) / Number of indicators from the given dimension $_{a,g}$

iii) Equation 03: Σ (Total weight of Dimensions A, B, C, D, E, F, G) / Number of Dimensions $_{a,g}$ = Magnitude Index (Overall Innovation Index)

The adaption of the INOVA-tec tool by including the indicators and scores presented by the Innovation Radar, as well as allocating weighting factors, weight ranges and correction factors enables the presentation of more contextualizable results, taking into account the reality of the MSEs analysed in the present work. A greater contextualisation of the results presented is possible as different scopes and opportunities of the

impacts of the actions developed is considered (Chart 3). The results presented by INOVA-tec rank the companies analysed as "Very Low Performance of Indicators", or up to 25%; "Low Performance of Indicators", or up to 50%; "Average performance of Indicators", or up to 75%; and "High Performance of Indicators", above 75% of the maximum possible score.

Chart 3. Adaption of INOVA-tec (JESUS, 2011) with the addition on new dimensions, indicators, scores, weight range and correction factors.

Dimension	Indicators	Score	Weight of indicator	Weight range	Correction factor
A - Offering	- Products - Daring	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Product from the same value chain +2 – Product from a new value chain
B - Platform	- Production System	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Eventually / Temporary +2 – Systematically / Permanent
C - Brand	- Brand - Brand leverage	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Eventually / Tm +2 – Systematically / Permanent +1 – Municipal +2 – State level +3 – Regional +4 – National +5 – International
D - Customers	- Identification of needs - Identification of markets - Use of customers' expressions	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Eventually / Temporary +2 – Systematically / Permanent +1 – Product

					from the same value chain +2 – Product from a new value chain +1 – Class A/B +2 – Class C/D +3 – Class E
E - Solutions	- Complementary solutions - Resource integration	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Same chain +2 – New chain +1 – Eventually +2 – Systematically
F – Relationship	- Facilities and amenities - Computerisation	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Temporary +2 – Permanent +1 – Eventually +2 – Systematically
G – Value capture	- Use of existing resources - Use of opportunities for interaction	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Temporary +2 – Permanent +1 – Eventually +2 – Systematically
H - Processes	- Process improvement - Management systems - Certifications - Management software - Environmental aspects - Waste management	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null -1 – Absence of ethical behaviour +1 – Eventually +2 – Systematically +2 – Socio-environmental project +2 – Support to community and technical associations
I - Organisation	- Reorganisation - Partnerships	1, 3 or 5	2 – significative for the value	-1 – deteriorates/decreases	0 – indifferent / null

	- External vision - Competitive strategy		chain 1 – not significative for the value chain	/null 1 – indifferent / stable +2 – improves/increases	+1 – Eventually +2 – Systemically +1 – Temporary +2 – Permanent +1 – Municipal +2 – State Level +3 – Regional +4 – National +5 – International
J – Supply Chain	- Supply chain	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Eventually / Temporary +2 – Systemically / Permanent +1 – Municipal +2 – State level +3 – Regional +4 – National +5 – International
K - Presence	- Points of sale - New markets	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Eventually / Temporary +2 – Systemically / Permanent +1 – Municipal +2 – State level +3 – Regional +4 – National +5 – International
L - Networking	- Dialogue with the customer	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Indirect +2 – Direct +1 – Eventually / Temporary +2 – Systemically / Permanent

M – Innovative Ambience	- External sources of knowledge I - External sources of knowledge II - External sources of knowledge III - External sources of knowledge IV - Technological daring - Innovative funding - Collections of ideas	1, 3 or 5	2 – significative for the value chain 1 – not significative for the value chain	-1 – deteriorates/decreases /null 1 – indifferent / stable +2 – improves/increases	0 – indifferent / null +1 – Indirect +2 – Direct +1 – Eventually / Temporary +2 – Systemically / Permanent +1 – Municipal +2 – State level +3 – Regional +4 – National +5 – International +1 – up to 10% of employees +2 – >10% of employees

Source: Authors' own compilation (2020) adapted from Sawhney (2006), Bachmann and Destefani (2008) and Jesus (2011).

5. Methodology

The present work is characterised as an exploratory, descriptive, empirical and comparative study. This study analysed the application of two different tools for measuring the degree of innovation in two Micro and Small enterprises (MSEs). The tools used for measuring the degree of innovation were the Innovation Radar (BACHMANN; DESTEFANI, 2008) and an adapted INOVA-tec approach (JESUS, 2011; JESUS, 2007).

Both tools were applied on two retail companies from the textile and clothing industry, located in the Brazilian State of Sergipe. The diagnosis was carried out on-site, directly with the companies' owners, in the year of 2019.

Aiming at drawing a more precise comparative analysis of the results, the following criteria were adopted: i) Value chain: textile and clothing industry; ii) Segment: retail; iii) Location: City of Aracaju, Brazilian State of Sergipe; iv) Background with the application of an Innovation Management process.

The adaptions carried out in INOVA-tec (JESUS, 2011; JESUS, 2007) were aimed at replicating the same dimensions and indicators which comprise the Innovation Radar (BACHMANN; DESTEFANI, 2008). However, the weighting factors, weight ranges, corrections factors and data handling process were based on the INOVA-tec tool itself (JESUS, 2011; JESUS, 2007).

6. Results and Discussions

Similar results were obtained when measuring the degree of innovation of companies using the Innovation Radar (BACHMANN; DESTEFANI, 2008). However, certain differences were verified in the results from

the analysis of the degree of innovation when using INOVA-tec (JESUS, 2011; JESUS, 2007).

The results from the Innovation Radar methodology (Table 1) highlight that the companies analysed in the present work were ranked according to the same degree of innovation, being characterised as "Little Innovative Companies", that is, the companies innovated little or did not innovate at all in the last 3 (three) years.

Table 1 – Results of the analysis of the degree of innovation of retail companies from the textile and clothing industry located in the city of Aracaju (Brazil) from the application of the Innovation Radar

Dimension	Indicators	Weight of indicator	Company A		Company B	
			Score of indicator	Score of Dimension	Score of indicator	Score of Dimension
A - Offering	- Products	1	1	1	5	4
	- Daring	1	1		3	
B - Platform	- Production System	1	3	3	3	3
C - Brand	- Brand	1	3	4	3	4
	- Brand leverage	1	5		5	
D - Customers	- Identification of needs	1	3	3	3	3
	- Identification of markets	1	3		3	
	- Use of customers' expressions	1	3		3	
E - Solutions	- Complementary solutions	1	1	1	1	2
	- Resource integration	1	1		3	
F – Relationship	- Facilities and amenities	1	1	1	3	4
	- Computerisation	1	1		5	
G – Value capture	- Use of existing resources	1	1	1	1	1
	- Use of opportunities for interaction	1	1		1	
H - Processes	- Process improvement	1	3	1.3	5	1.7
	- Management systems	1	1		1	
	- Certifications	1	1		1	
	- Management software	1	1		1	
	- Environmental aspects	1	1		1	

	- Waste management					
I - Organisation	- Reorganisation - Partnerships - External vision - Competitive strategy	1 1 1 1	1 3 1 1	1.5	1 3 1 3	2
J – Supply Chain	- Supply chain	1 1	1	1	3	3
K - Presence	- Points of sale - New markets	1 1	3 5	4	3 1	2
L - Networking	- Dialogue with the customer	1	1	1	3	3
M – Innovative Ambience	- External sources of knowledge I - External sources of knowledge II - External sources of knowledge III - External sources of knowledge IV - Technological daring - Innovative funding - Collections of ideas	2 2 2 2 2 2 2	1 1 3 1 1 1 1	1.3	1 3 3 1 1 1 3	1.9
Degree of innovation			**2.0**		**2.8**	

Source: Field Research (2019).

Although the results obtained from the application of the Innovation Radar classify both of the companies analysed with the same degree of innovation, “Company B” presented higher scores in most of the dimensions considered. Moreover, greater differences were verified among the scores obtained for the offer and relationship dimensions. Nevertheless, “Company B” presented the best result only in the presence dimension.

One of the aspects that can be improved in the Innovation Radar Tool lies on the allocation of the different weighting factors and corrections factors for some indicators. This would avoid an overlap of innovation profiles, despite the fact that the final result is presented based on the average score of the dimensions analysed.

The results obtained in the present study are similar to the average degree of innovation of 82 obtained for another MSE from the textile and clothing industry, analysed by Néto and Teixeira (2011) in the Brazilian State of Sergipe in 2010. In this study, an average degree of innovation of 2.1 was obtained from the application of the Innovation Radar, with the highest scores being found by the indicators in the platform

and brand dimensions. On the other hand, the dimensions processes, value capture, supply chain and organisation led to the lowest scores.

Néto and Teixeira (2011) observed that the degree of innovation can be a guidance for actions that must be prioritised, aimed at promoting an innovation culture within a company. In line with this statement, Carvalho et al. (2015) consider that the Innovation Radar can support companies in defining strategies for innovation, thus contributing to achieve greater competitive advantage to a company by highlighting the dimensions which have been little explored and can constitute competitive advantages.

Regarding the analysis of the degree of innovation through the application of the adopted version of INOVA-tec, the results obtained ranked the companies according to different degrees of innovation, with a considerable difference between the scores obtained (Table 2). "Company A" was characterised as a company with a "Very low performance of the given indicators", with the sum of the weights of the dimensions equal to 67.71 points, corresponding to a degree of innovation (overall innovation index) of 5.20. In turn, "Company B" was classified as a company with a "Low performance of the given indicators", with a total score of 129.16 points, corresponding to a degree of innovation (overall innovation index) of 9.93, as pointed out in Tables 3 and 4.

According to Jesus (2011, 2007), INOVA-tec allows to balance the relevant parameters for a case-by-case assessment of the results. Therefore, the tool enables a more detailed process analysis, establishing more responsible innovations.

Table 2 – Results from the analysis of the degree of innovation of retail companies from the textile and clothing industry located in the city of Aracaju (Brazil), analysed by the INOVA-tec tool with adaptions

Dimension	Indicators	Score of indicators		Weight of indicator		Score range		Correction Factor		Final Score of Indicator	
		A	B	A	B	A	B	A	B	A	B
A - Offering	- Products	1	5	2	2	+1	+2	0	+1	2	21
	- Daring	1	3	2	2	+1	+2	0	+1	2	13
B - Platform	- Production System	3	3	2	2	+1	+1	0	0	6	6
C - Brand	- Brand	3	3	2	2	+1	+1	0	0	6	6
	- Brand leverage	5	5	2	2	+1	+1	+2 / +1	+2 / +3	13	15
D - Customers	- Identification of needs	3	3	2	2	+2	+2	+1 / +1	+1 / +1	14	14
	- Identification of markets	3	3	2	2	+2	+2		+1 / +2	15	13
	- Use of customers' expressions	3	3	2	2	+2	+2	+1 / +2	+2	13	14
								+1			
E - Solutions	- Complementary solutions	1	1	2	2	1	1	0	0	2	2
	- Resource integration	1	3	1	1	1	+2	0	+1 / +2	1	9
F – Relationship	- Facilities and amenities	1	3	2	2	1	+2	0	+2	2	14
		1	5	2	2	1	+2	0	+2	2	22

	- Computerisation										
G – Value capture	- Use of existing resources - Use of opportunities for interaction	1 1	1 1	1 1	1 1	1 1	1 1	0 0	0 0	1 1	1 1
H - Processes	- Process improvement - Management systems - Certifications - Management software - Environmental aspects - Waste management	3 1 1 1 1 1	5 1 1 1 1 1	2 2 1 2 1 1	2 2 1 2 1 1	+2 1 1 -1 1 1	+2 1 1 -1 1 1	+1 0 0 0 0 -1	+2 0 0 0 0 -1	13 2 1 -2 1 0	22 2 1 -2 1 0
I - Organisation	- Reorganisation - Partnerships - External vision - Competitive strategy	1 3 1 1	1 3 1 3	2 2 2 2	2 2 2 2	+1 +2 1 1	+1 +2 1 +2	0 +2 / +2 0 0	0 +2 / +2 0 +1 / +1	2 16 2 2	2 16 2 14
J – Supply Chain	- Supply chain	1	3	2	2	+1	+2	0	+3	2	15
K - Presence	- Points of sale - New markets	3 5	3 1	2 2	2 2	+2 +2	+2 1	+2 +1 / +1	+2 0	14 22	14 2
L - Networking	- Dialogue with the customer	1	3	2	2	+1	+2	0	+2 / +2	2	16
M – Innovative Ambience	- External sources of knowledge I - External sources of knowledge II - External sources of knowledge III - External sources of knowledge IV - Technological daring - Innovative funding - Collections of ideas	1 1 3 1 1 1 1	1 3 3 1 1 1 3	2 2 2 1 2 1 2	2 2 2 1 2 1 2	0 0 1 1 0 1 0	0 +2 +2 1 1 1 1	0 0 +1 / +3 0 0 0 0	0 +2 / +3 +1 / +3 0 0 0 0	0 0 10 1 0 1 0	0 17 15 1 2 1 6

Source: Field Research (2019).

Table 3 – Sum of the weight of the dimensions (maximum and minimum) and the magnitude index (maximum and minimum) of retail companies from the textile and clothing industry in the city of Aracaju (Brazil), analysed using the INOVA-tec tool

Sum of weight of indicators		Magnitude Index	
Maximum	**Minimum**	**Maximum**	**Minimum**
293.51	-9.23	22.58	-0.71

Source: Field Research (2019).

Table 4 – Maximum thresholds for the classification of the degree of innovation (overall innovation index) of retail companies from the textile and clothing industry located in the city of Aracaju (Brazil), analysed using the INOVA-tec tool

Type of Company	Range	Threshold	Company A	Company B
Very low performance of the given indicators	Range 1	Up to 5.64	5.20	
Low performance of the given indicators	Range 2	Up to 11.28		9.93
Average performance of the given indicators	Range 3	Up to 16,.93		
High performance of the given indicators	Range 4	Up to 22.58		

Source: Field Research (2019).

The results obtained show a certain feasibility of the application of the adopted version of INOVA-tec for measuring the degree of innovation of the SMEs analysed in the present work. The different results of the companies analysed by this adapted tool show to a more dynamic and innovative entrepreneurial behaviour of "Company B", which presents systematic methods, as well as a systematic vision of its management processes. In addition, the company has a more systematic approach in its relationship with customers, marketing and in the search for solution in external environments when compared with "Company A", mainly taking into account the geographical scope and permanent flow of actions, despite the same result obtained from the application of the Innovation Radar.

According to Cavalcanti et al. (2015), innovation metrics have been a topic of growing interest in studies on innovation economy, exploring the complex relationship between investment on innovation and funding of resources. Therefore, it is possible to examine innovation and the consequent actions which allow companies from the textile industry and other sectors to: i) carry out a progressive review on the innovation metrics which support the innovative capacity of an organisation; ii) seek greater understanding of the process of innovation for increasing an integrated, effective and precise innovation metric system for the company; iii) consider that current innovation metrics are established upon various dimensions which inform on the state of innovative development of a certain company. Accordingly, it enables greater focus on the development of the dimensions established, causing greater impact on the growth of the organisation within a certain market sector (CAVALCANTI et al., 2015).

In this regard, the application of the adapted version of INOVA-tec presented in this work demonstrated positive contributions for contextualising the measurement of dimensions which can cause greater impact on the growth of a certain organisation within a given market sector. Consequently, this growth can in fact contribute to the development of an integrated, effective and precise innovation metric system.

Silva et al. (2008) presented a model for analysing the level of technological innovation, by gathering different indicators and score criteria. Thirty (30) multiple-choice questions were developed, being subdivided into 5 different groups corresponding to indicators on technological innovation. Through this methodology, different weights were only attributed to the group of indicators in the dimensions "output indicators" and "impact of innovation". On the other hand, the indicators in the dimensions "input indicators", "forms of innovation" and "sources of innovation" did not receive different weighting factors, being non-contextualizable.

Similar to the present study, the approach proposed by Silva et al. (2008) also establishes different ranks for the profile of innovation corresponding to the maximum percentage scores related to the indicators and their respective weights. Accordingly, Silva et al. (2008) presented the following classification for the level of a company's technological innovation: i) Innovative – IN (from 80% to 100% of the maximum score); ii) Averagely Innovative – MIN (from 40% to 79.9% of the maximum score); and iii) Little Innovative – PIN (from 0% to 39% of the maximum score). Silva et al. (2008) verified that Brazilian companies classified as more intra-entrepreneurial and innovative reached an average score within the range from 80% to 100% of the maximum score.

7. Conclusions

The results obtained in the present study conclude that the adapted version of the INOVA-tec tool enables a contextualisation of the process for measuring the degree of innovation in MSEs. The adapted methodology considers different perspectives of the particularities faced within the value chain of the companies analysed, as well as different perceptions of the innovation actions implemented. Therefore, this approach assesses the relevance of indicators with regards to the give value chain or type of service offered, taking into account a specific time frame and geographical scope of the actions and their respective impacts. This given contextualisation is related to the innovation actions, which can present different weighting coefficients, weight ranges or correction factors. For instance, if they are significant for the respective value chain; if they are occasional, temporary or systematic; if the impacts of the actions are positive, stable or negative; if the geographical scope englobes a municipal, state, regional, national or international scope.

In this regard, considering these factors provides a greater range of analysis of the results, with wider categories, which are directly proportional to the weighting factors, score ranges and correction factors in the assessment of the given indicators.

Future studies can include a larger population and sample, besides enabling an analysing of the adapted INOVA-tec methodology in other economic sectors. Moreover, future research can explore a predictive analysis of the potential impact of the innovation actions in MSEs, which can contribute to establishing further selection criteria, prioritising inherent actions to the process of innovation management and sustainable development.

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