IS INNOVATION A KEY DRIVER OF BUSINESS PERFORMANCE? THE CASE OF BRAZILIAN MICRO AND SMALL BUSINESSES

Area: Entrepreneurship, startups and innovation

Abstract

This study evaluates the relationship envisaged between company innovation and performance based on a sampling of 939 Brazilian Micro and Small Businesses. The innovation variables were gathered by using SEBRAE's Innovation Radar questionnaire and company performance was based on a MEG (SEBRAE) questionnaire. The data was treated by using multivariate statistics for the set of data and a qualitative comparative analysis (QCA) using part of the data, in order to clarify the terms of occurrence of the phenomenon of prediction between innovation and performance identified in the regression. .Our findings revealed that seven (brand, clients, added value, procedures, organization, presence and innovative ambience) of the original thirteen Radar dimensions impacted on company performance. In addition, company performance in the study sampling is achieved under two non-exclusionary conditions: i) sob high scores were shown in the dimension 'organization'; or that ii) high scores were present in both the 'clients' and 'supply' dimensions.

Keywordds: Innovation. Micro and Small Businesses (MPE). Performance. Innovation indicators.

Resumo

Este estudo avalia a relação de predição entre inovação e desempenho empresarial em uma amostra de 939 micro e pequenas empresas brasileiras. As variáveis de inovação foram coletadas com aplicação do questionário do Radar da Inovação (SEBRAE) e as variáveis de desempenho empresarial provêm do questionário MEG (SEBRAE). Os dados foram tratados com estatística multivariada para o conjunto de dados e com a análise qualitativa comparativa (QCA) com parte dos dados, para esclarecer as condições de ocorrência do fenômeno de predição entre inovação e desempenho identificado na regressão. Nossos resultados revelam que sete (marca, clientes, agregação de valor, processos, organização, presença e ambiência inovadora) das treze dimensões originárias do Radar impactam o desempenho empresarial. Também, o desempenho empresarial na amostra do estudo é alcançado em duas condições não excludentes: i) sob presença de escores elevados na dimensão 'organização'; ou ii) sob presença de scores elevados em ambas as dimensões 'clientes' e 'oferta'.

Palavras-chave: Inovação. Micro e Pequenas Empresas (MPE). Desempenho. Indicadores de inovação.

1. INTRODUCTION

Innovation and company performance is an issue that has been discussed for some time. Schumpeter (1934) already foresaw that innovative companies would be those with the capacity to generate value, that is to say, an innovative company should be able to achieve a higher performance (Marín-Idárraga & Cuartas-Marín, 2019). Thus, although the relationship between innovation and performance is recognized in literature (Marín-Idárraga & Cuartas-Marín, 2019), to operationise these is not simple, which explains why it is preferable to frequently measure innovation, instead of evaluating its impact, as shown by the measures proposed in the Oslo Manual (OCDE, 2005) and operationalized in Brazil by , PINTEC 2014 (IBGE, 2016). Thus,, the assumption that innovative companies should achieve a higher performance ends up becoming a common axiom that is not submitted, with some exceptions, to empirical testing, such as in the case of Rosenbusch, Brinckmann and Bausch (2011).

Innovation can be measured by means of a set of impact and effort indicators, as shown by the example proposed PINTEC 2014 (IBGE, 2016). Amongst such indicators, it is often the case that innovation is seen from a wider or sectorial perspective, based on an approach knowns as innovation systems (LUNDVALL, 1992). The innovation system highlights the core importance of innovation as a source of productivity growth and material well-being, and is accepted as being a broad, interdependent, complex and dynamic process, in which economic, social, cultural and historic institutions are involved (CASALI; SILVA; CARVALHO, 2010).

When dealing with innovation and small businesses, few studies manage to provide more robust conclusions. Amongst these, is the work of Marín-Idárraga & Cuartas-Marín (2019), who studied nearly 600 Micro & Small Businesses in the city of Bogotá, and concluded that innovation represents a positive relationship with company performance. Another useful contribution that should be noted is the work of Gomes e Wohjan (2017). Based on a sampling of 92 Small Businesses involved in the manufacture of textiles in the Valley of Itajaí (SC), these authors confirmed the relationship between innovative performance and organizational performance. These works show that, as stated by Love and Roper (2015), and even though Micro & Small Businesses are more dependent on outside resources, they have the capacity to innovate.

Some works have thought about how to generate innovation. Sawhney, Wolcott and Arroniz (2006) state that innovation in business is all about new values and not necessarily about new things. . These authors suggest that managers think holistically, in terms of all the possible dimensions of their organization in order to innovate. This is why they proposed the Radar of Innovation (Sawhney, Wolcott & Arroniz, 2006), which aims to outline the good innovation practices of an organization in 13 dimensions – Supply, Platform, Brand, Clients, Solutions, Relationships, Added Value, Procedures Organization, Supply Chain, Presence, Innovative Network and Environment. . Thus, , for the purpose of our study and following the recommendations put forward by Sawhney et al. (2006), a Micro & Small Business that fulfills a high level of the 13 practices associated with the dimensions outlined by the Radar of Innovation can be considered to be innovative companies.

For the purpose of this study, we used the Management Excellence Model (MEG) data source for the dependent variable. . This is a company performance measurement that can be applied to Micro & Small Businesses and which is based on eight dimensions: Leadership. Strategies and Plans, Clients, Society, Information and knowledge, People, Processes and Results.

The Radar of Innovation has been disseminated by the Local Innovation Agents Programme (ALI) of the Brazilian Micro & Small Business Support Service (SEBRAE),

and through the Management Excellence Model (MEG) of the National Quality Foundation (FNQ). When choosing to test the prediction ratio relationship using data gathered using these two methodologies, we would like to offer the following two suggestions: i) establish empirically the manifestation of the prediction ratio, which is frequently accepted theoretically but not always proven; and ii) empirically test the behavior associated with two empirical methodologies used in Brazil: The Radar of Innovation (Sawhney et al., 2006), and the Management Excellence Model (MEG) to independently evaluate innovation and performance in Micro & Small Businesses,

2.   THEORETICAL BACKGROUND

2.1 Innovation in Micro & Small Businesses

In his initial discussion, Schumpeter (1943) recognized innovation as a phenomenon that predominately occurs in large scale companies who carry out internal research and development (R & D) activities. This makes sense, bearing in mind that the Micro & Small Businesses only became aware of the concept of strategy as a parameter in the 1970s, with the publication of the text by Minztberg (1973).

Although contemporary literature widely recognizes the fact that Micro & Small Businesses are capable of generating their own innovation (Gomes & Wohjan, 2017; Marín-Idárraga & Cuartas-Marín , 2019; Rosenbusch,   & 2011), the theoretical peculiarities that appear in this phenomenon within this organizational spectrum still present lacunas.

In general, literature recognizes that Micro & Small Business show that it is an advantage to be able to make swift decisions, with higher propensity for risk and flexibility in responding to Market opportunities (Mintzberg, 1973), but show they are less capable of operating at a higher scale and attracting specialized resources when compared to larger companies (Love; Roper, 2015). Thus, the competitive advantages of Micro & Small Businesses is concentrated on behavioral resources, such as "entrepreneurial dynamism, flexibility, efficiency, proximity to the Market, motivation!, while larger companies concentrate their advantages on material resources, which can manifest themselves, for example, as "economies of scope and scale and financial resources and technology" (Vossen, 1998, p. 90). We also know that Micro & Small Businesses tend to present reduced internal resource availability when compared to larger firms, which makes them more dependent on external resources originating in the ecosystems of innovation in which they operate (Love; Roper, 2015).

When highlighting the fact that the capacity to generate innovation is a predictor of the exporting capacity of Micro & Small Businesses, that is to say (a proxy for business performance), Love and Roper (2015) indicated the internal and external facilitating resources and practices (vectors) for innovation within these companies Among the internal facilitators, human skills are highlighted, including technical abilities and creativity during the initial stages of innovation projects and marketing abilities during their commercialization stages   (Love & Roper, 2015) as well as the learning capacity of the organization (Gomes & Wohjan, 2017); leadership; the abilities of internal employees; the development of internal Research and Development. which is predominately manifested in a non-formalized ad hoc and opportunistic manner by these firms): capital invested and capacity to fund equipment internally (Love & Roper, 2015), or to have access to resources for investments (Marín-Idárraga & Cuartas-Marín, 2019); investments in design, of products; speed of access to the Market and the ability to maintain a degree of secrecy about products ; adopting open innovation strategies in a collaborative way with other firms operating within the supply chain as a response to the low level of available

resources (Gronum; Verreynne; Kastelle, 2012); and predominance of transnational rather than transformational leadership, as occurs in larger firms, which makes it possible to monitor and reward more closely connected employees (Love; Roper, 2015). We should also underline other aspects, such as how the age and culture of a company can be predictive of innovation in Micro & Small Businesses (Rosenbusch et al., 2011).

Among the external resources and practices associated with promoting Micro & Small Business innovation, those involving collaborative arrangements should be highlighted, such as adopting external knowledge outside a firm's boundaries, the use of social or labor Market contacts, which are common in agglomeration economies, which are transformed into increased company performance (Brunswicker; Vanhaverbeke, 2015); using openness in partnership with other firms in order to acquire technical knowledge or market information; or acquiring export market knowledge (Love; Roper, 2015). Learning by exporting is especially significant for firms operating in highly intensive knowledge markets or which are highly competitive (Love; Roper, 2015). Even so, other external factors should be highlighted, the offer of resources to Micro & Small Businesses, such as subsidies or financing to fund internal Research & Development (P & D); the speed at which innovation is adopted within the market in which a firm operates ; and the role of consumers-leaders in the demand for innovation (Love; Roper, 2015). Finally, network participation represents an additional external practice: when characterizing innovation as a mediator in the positive relationship between exercising network links and achieving better performance in Micro & Small Businesses (Love; Roper, 2015). Gronum, Verreynne and Kastelle (2012, p. 272) make it clear that the results of innovation represent intermediary outcomes that show that networks are elements of the innovation process that generate company performance within Micro & Small Businesses .

2.2 The Radar of Innovation as a measurement tool

The Radar of Innovation is a methodological tool derived from the works of Sawhney, Wolcott and Arroniz (2006) and Bachmann and Destefani (2008). This involves a graphic scale, generally presented in the format of a radar, which is composed of 13 dimensions that explain innovation (Supply, Platform, Brand, Clients, Solutions, Relationships, Added Value, Procedures, Organization, Supply Chain, Presence, Innovative Network and Environment). Of these, the supply chain, network and relationships are associated with innovation systems and observed from outside a company's internal sphere. These dimensions and their associated variables are summarized in Table 2.

Thus, this involves a measure of maturity in the process of Micro & Small Business innovation, established on the basis of their procedures, outcomes and the importance given to knowledge as a tool aimed at competitiveness. The Radar of Innovation differs from the well-known Innovation Ratio adopted by PINTEC (IBGE, 2016) – which corresponds to the percentage of firms that have implemented product or process innovation in relation to the total number of responding companies - .because they adopted a more limited focus and evaluated the generation of innovation from each company's individualized perspective, but while also considering their relationships with the innovation system (SEBRAE, 2014).

Table 2: Dimensions and variables in the Radar of Innovation

Dimension		Issues
Supply	1	Operation in new markets.
	2	Launch of new products.
	3	Removal of products that are not a Market success.
	4	Changes in a product's characteristics for environmental reasons.
	5	Significant change in the design of products.

	6	Adopting innovation technologies.	
Plataform	7	Resources used for family of products.	
	8	Same product offered in different versions for new markets	
Brand a	9	Registering brand names.	
	10	Using the company brand in different ways.	
Clients	11	Identifying new clients' needs.	
	12	Identifying new markets.	
	13	Using feedback from clients (suggestions, complaints) to develop new products.	
	14	Launching products based on the needs of the clients.	
Solutions	15	Offer new complementary customer solutions	
	16	Offer new solutions based on resource integration	
Relationships	17	Improve clients relationships by means of facilities or resources A.	
	18	Use computer-based resources to relate with clients.	
Added Value	19	Use existing resources to generate new revenue.	
	20	Use relationships with partners to generate new revenue.	
Procedures	21	Improve procedures.	
	22	Adopt management practices.	
	23	Adopt certification.	
	24	Adopt management software.	
	25	Improve procedures in relation to environmental issues.	
	26	Reduce or use waste.	
Organization	27	Reorganize or use new approaches for company activities.	
	28	Establish new partnerships.	
	29	Adopt new ways of exchanging information and ideas with clients and suppliers.	
	30	Make change to competitive strategy. s.	
Supply Chain	31	Improve transport, distribution and stocks.	
Presence	32	Create new outlets or sales channels.	
	33	Establish new relationships with distributors and commercial representatives.	
Network	34	Adopt new ways of communicating with clients.	
Innovative environment	35	Use consultants or the support of institutions such as universities, SEBRAE etc.	
	36	Participate in events in order to obtain information.	
	37	Seek out new knowledge with suppliers and clients.	
	38	Invest in acquiring technology, know-how, techniques, etc.	
	39	Invest in intellectual property.	
	40	Implement projects to develop or introduce technological innovation.	
	41	Use government support programmes for innovative activities. .	
	42	Use idea management systems. t.	

Source: Bachmann and Destefani (2008), Carvalho et al. (2015) and Sawhney, *et al.* 2006.

2018 marked the first decade since the Local Innovation Agents Programme – ALI was adopted and, recently, literature produced in Brazil has been analyzing its findings from a sectorial perspective (Néto, Teixeira, 2014; Vasconcelos et al, 2016), intersectorial (Carvalho et al, 2015; Oliveira et al, 2014) and applied to specific cases, such as those mentioned by Silva et. al (2018), Lima and Muller (2017), Simões et al. (2015), Cunha et al. (2015) and Paredes et al. (2014). Another set of studies describe the use of Radar of Innovation methodology that forms the basis of the ALI Programme, from intra and inter-sectorial perspectives (Paredes et al, 2015; Bichueti, 2013) and which is applied in specific cases, as described by Braga et al (2015) and Aff and Araújo (2013). In addition, there are other studies that analyze the specific dimensions of the Radar of Innovation, including those by Souza and Heinzmann (2014), Silva and Araújo (2014) and Capeleiro (2013).

2.3 A company performance measurement: Management Excellence Model

Measuring performance in Small Businesses continues to present a challenge for the academic community, bearing in mind that, from a strategic point of view, this type of company shows little concern in formalizing their business (Mintzberg, 1973). Authors like Costa et al. (2019); Marzall et al. (2018) and Perlin et al. (2018) have studied the problem and proposed solutions based on case studies. . However, Damke et al. (2018); Gomes and Wohjan (2017); Rosenbusch et. al. (2011) have sought to fill this gap through quantitative research.

According to Garengo, Biazzo and Bititci (2005), understanding the performance of a Micro & Small Business can provide useful information for these companies, concerning changes of a more incremental character. c. Nevertheless, performance is affected by a great number of variables, and it is difficult to quantify the effects that these variables have on performance (Garengo et. al., 2005). When studying eight performance evaluation models for Micro & Small Businesses, which were published after an interval of just over ten years, Garengo et. al. (2005) understood how these models had evolved. The following are the dimensions that Garengo et. al. (2005) researched:

a) Strategy alignment;
b) Improvements based on strategy;
c) Focus on stakeholders;
d) Stability in the type of measurement used;
e) Dynamic adaptability;
f) Process guidelines;
g) Create indicators based on measurements;
h) Coverage of all macro processes in evaluating performance;
i) Clarity and simplicity in indicators.

We adopted the National Quality Foundation's (FNQ) Management Excellence Model (MEG) to measure Micro & Small Business performance. Amongst its measurements, the MEG uses 37 questions that comprise eight main dimensions (Table 3): Leadership, Strategy and Planning, Clients, Society, Information and knowledge, People, Processes and Outcomes. Based on this methodology, we produced an individual score for each organization which is admissable as company performance.

Table 3: Criteria for the Management Excellence Model (MEG)

Dimension		Issues
Leadership	1	Has the company's mission been defined and is it know to employees?
	2	Do company directors encourage ethical behaviour in both internal and external relationships?
	3	Do company directors analyze company performance?
	4	Do company directors share information with their employees?
	5	Do directors invest in their own management development and apply the knowledge acquired in their own company?
	6	Does the search for information to identify innovation opportunities include external sources and are employees encouraged to present their own ideas that can be transformed into innovation?
Strategy & Planning	7	Is the company's vision already defined and is it known to employees?:
	8	Have the strategies that enable a company to achieve its objectives already been defined?
	9	Have the indicators and methods related to strategy already been established?
	10	Have the company's action plans for achieving its goals in relation to strategy, already been defined?
Clients	11	Are clients grouped and are their needs and expectations identified?
	12	Are products and services known to the clients?
	13	Are customer complaints registered and dealt with?
	14	Is client satisfaction evaluated?

	15	Is information obtained from clients analyzed and used to strengthen their loyalty and to attract new clients?
Society	16	Are the necessary legal requirements known and kept up to date?
	17	Is the negative impact on the environment caused by the company known and dealt with
	18	Does the company shown its committment to the community through their actions or social projects?
Information & knowledge	19	Is the necessary information needed for the planning, implementation and analysis of the company's activities and for decision-making defined and made known to employees?
	20	Is knowledge sharing encouraged?
	21	Are improved management practices encouraged?
	22	Does the company obtain and use comparative information when analyzing products/services and process performance and improvement?
People	23	Have the functions and responsibilities of personnel (directors and employees) been defined?
	24	Are employees selected according to defined standards and in accordance with job requirements?
	25	Are employees trained for their Jobs?
	26	Are the dangers and risks related to health and safety at work identified and dealt with?
	27	Is the well-being of employees encouraged?
Processes	28	Are principal business procedures carried out in a standardized form, with documented standards?
	29	Are the principal business procedures controlled so as to guarantee that the needs of the client are satisfied?
	30	Are company suppliers selected and evaluated according to established critera?
	31	Are company finances controlled so as to optimize the use of resources?
Outcomes	32	Does the company have available client satisfaction outcomes?
	33	Does the company have available outcomes related to client complaints?
	34	Does the company have available outcomes related to employee training?
	35	Does the company have available outcomes related to acidentes involving employees?
	36	Does the company have available outcomes related to work productivity?
	37	Does the company have available outcomes related to profit margins?

Source: National Quality Foundation - FNQ (2014) and SEBRAE (2016).

The Brazilian Micro & Small Business Support Service, within the ambit of the Local Innovation Agents Programme (ALI), applies a diagnose that aims to evaluate the degree of maturity of Micro & Small Business management, by means of a consolidated instrument which is the MPE Brazil questionnaire, which also subsidizes the MPE Prize (SEBRAE, 2016). The dimensions adopted by SEBRAE and the FNQ for management excellence are shown in the theoretical-empirical evidence included in several national and international studies (ROTHWELL, 1994; OECD, 2005; HOFFMANN et al. 2017). We propose the following based on this example:

H1. Innovation from a multidimensional point of view has an effect on the company performance of Micro & Small Businesses. .

3. METHODS

Universe and sampling. This study has adopted a quantitative approach with regards to its purpose and is descriptive with regards to its nature. Our data sources originated in two distinct data bases, but contain information about the same companies. The data base shows approximately 4.800 companies. We selected one sampling of 939 Micro & Small Businesses established in the Federal District of Brasilia, based on the following criteria: (i) geographical location in two new districts of the Federal District, Águas Claras and Vicentes Pires; and (ii) amount of data effectively collected by 20 (twenty)

agents that were advised by one of the researchers of this article, 2each agent had a target of at least 40 companies. Data was gathered for the years 2015 and 2016. . We followed the recommendation to gather sufficient data in order to obtain a reliable regression model, that should include a minimum of 10 data case studies for each proactive model, in that 15 cases are recommended for each predictor variable (FIELD, 2009). I Thus, in order to test the effect of 13 predictors studied in this research, 939 Micro & Small Businesses from the Federal District of Brasilia formed the basis of this sampling. .

Tools. We used the ALI programme in order to establish the independent variable – innovation, which were created by SEBRAE – the Brazilian Micro & Small Business Support Service. The ALI principal (Table 2) was developed from the Radar of Innovation by Sawhney et al. (2006), and applied to Micro & Small Businesses. . The survey that measures a company's innovation catalyzers was structured using 42 questions that form 13 dimensions. Each question is evaluated using a scale of 1 (low), 3 (average) and 5 (high). . Individual scores were calculated for the level of services, for each of the dimensions that compose the Radar of Innovation. These individual scores were organized in decreasing order. For performance variables, we used the MEG® principle. This was created - by applying the National Foundation of Quality's (FNQ) Management Excellence Model questionnaire, in which every question is evaluated between 0 and 100 and the measurement variables are given different weights (Table 3). We retained the structure of the original weight of the tools.

Data analysis processing. The data was processed in two stages. In the first, we tested the explanatory power of each Radar of Innovation dimension in relation to the performance of the sample data by means of multiple regression. In the second stage, we adopted a Qualitative Comparative Analysis – QCA to verify how the component dimensions of the Radar of Innovation influence company performance shown in the sampling. QCA - *Qualitative Comparative Analysis*). The Qualitative Comparative Analysis – QCA is a systematic and precise method, based on mathematics (Boolean Algebra) and on formal logic (RAGIN, 1987). For the purpose of this research, we followed the recommendations pur forward by Ariza and Gandini (2012) to include, for the purpose of comparison, cases that involved situations of both success and failure. . The use of the QCA is generally defined for an intermediary *N* , in which most of the applications are found in a wide interval of 10 to 15 cases, although there are studies that involve research applications in a large number of cases (RIHOUX; RAGIN, 2009). In order to create the sub sample to which we applied the QCA, we isolated two distinct groups: the 15 Micro & Small Businesses with the highest scores in terms of company performance and the 15 companies with the lowest scores.

4. FINDINGS

In order to test the explanation of each dimension in the data sampling of the Radar of Innovation in relation to Performance, we applied a Multiple Regression test by means of the following equation: :

Company performance$i$ = b0 + b1Supply$i$ + b2Platform$i$ + b3Brand$i$ + b4Clients$i$ + b5Solutions$i$ + b6Relationships i + b7Added value$i$ + b8Procedures i + b9Organization$i$ + b10Supply chain$i$ + b11Presence$i$ + b12Network$i$ + b13Innovative environment$i$

The analysis of the correlation matrix provides an approximate idea of the relationship between the predictors and the output variable as well as for an initial examination of multicollinearity. When analyzing R (the Pearson correlation coefficient) only in the case of predictors, ignoring company performance, the highest correlation is

between innovative environment and organizations with $R = 0.489$ ($p < 0,001$). In spite of the significance of this correlation, the coefficient is low and, therefore, indicates that the predictors are measuring different things (collinearity does not exist). According to Field (2009), if multicollinearity does not exist in the data, then there should be no substance correlation values ($R > 0.90$) between the predictors.

Table 1: Summary of the regression model [b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	,662[a]	,439	,431	11,09764	,439	55,591	13	925	,000	1,219

a. Predictors: (Constant), Innovation environnment, Presence, Network, Platform, Supply chain, Supply, Solutions. Added value, Brand, Clients, Procedures, Relationships, Organization
b. Dependent Variable: Management performance.

Table 2: Multiple regression of a Innovation predictor dimensions and their effect on company Performance

Model	Unstandardized coefficients		Standard coefficients			Collinearity Statistics	
	B	Standard error	Beta	t	Sig.	Tolerance	VIF
(Constant)	-10,947	1,725		-6,347	,000		
Aupply	,070	,326	,006	,213	,831	,820	1,220
Plataform	-,026	,259	-,003	-,102	,919	,802	1,246
Brand	3,237	,395	,232	8,205	,000	,759	1,317
Clients	1,331	,482	,083	2,763	,006	,668	1,496
Solutions	,415	,388	,030	1,070	,285	,786	1,271
Relationships	-,478	,355	-,041	-1,345	,179	,656	1,525
Added value	2,632	,530	,141	4,969	,000	,751	1,331
Procedures	2,085	,726	,087	2,872	,004	,665	1,504
Organization	2,911	,483	,188	6,032	,000	,623	1,606
Supply chain	,347	,351	,027	,988	,324	,840	1,190
Presence	,885	,415	,058	2,135	,033	,823	1,215
Network	-,031	,290	-,003	-,106	,916	,707	1,414
Innovative environment	4,526	,735	,192	6,158	,000	,622	1,608

Source: Research data .

The coefficient value of the multiple correlation between the predictors and output, that is to say, 0.662, is shown in column R of Table 1. The next column provides a value of R^2, a measurement of how much variability of a dependent variable can be subtracted from predictors. In the case of this model, this value is 0.439, which means that the predictors (independent variable) are responsible for 43.9% of the variation in management performance (dependent variable).

The adjusted R^2 provides a notion of how well our model generalizes, that is to say, the difference is small for the final model. . In fact, the difference between the values is 0.439 – 0.431 = 0.008 or approximately 0.8%. This means that if the model was based on population instead of a sampling, it would explain approximately 0.8% less of a output variance.

In addition, a change in the variance that can be explained provides an F ratio of 55.59, which is significant ($p < 0.001$). The Durbin-Watson statistic is 1.22, the findings of which show that the independent hypothesis of errors is met, since the value is between 1 and 3 (FIELD, 2009). Furthermore, the findings of the variance analysis (ANOVA), which tests if the model is the best to predict output variance, was significant. ($p < 0.001$). Thus, the model aderes to the data in a significant manner

Table 3: Groups of Micro & Small Businesses with the best and worst performance.

Score/ weight	15	9	9	6	6	9	16	30	100
Companies	Leadership	Strategies & Plans	Clients	Societys	Information & knowledge	People	Procedures	Outcomes	Total / Management performance
E150	12,63	6,31	9	5,5	5,26	8,1	16	27,5	90,3
E449	12,63	4,29	7,29	6	3,53	7,29	14	30	85,03
E119	13,25	4,74	9	4	5,63	9	13,2	23	81,8
E123	10,88	5,3	5,94	2,6	4,21	9	15	22,5	75,4
E460	12,63	9	6,84	4,1	3,9	7,29	15	15	73,76
E172	11,9	4,74	5,94	4	4,89	5,58	12	24	73,1
E100	13,25	6,31	7,29	2,6	5,26	5,22	15	18	72,9
E105	13,25	6,31	7,29	2,6	5,26	5,22	15	18	72,9
E112	13,25	6,31	7,29	2,6	5,26	5,22	15	18	72,9
E115	13,25	6,31	7,29	2,6	5,26	5,22	15	18	72,9
E120	13,25	6,31	7,29	2,6	5,26	5,22	15	18	72,9
E464	10,88	9	6,84	4,1	3,9	7,29	15	15	72,01
E199	9,64	4,29	5,13	4,6	4,89	6,84	10,2	26,25	71,8
E200	9,64	4,29	5,13	4,6	4,89	6,84	10,2	26,25	71,8
E124	12,01	3,38	6,3	2,7	4,58	5,22	15	21,75	70,9
E691	0	0	1,08	1,5	1,35	0	3,6	0	7,53
E902	1,5	0	2,43	1,8	0	0	1,2	0	6,93
E58	0	0	0,54	0,6	0,45	1,08	3,6	0	6,3
E317	2,25	0	0,54	1,5	0,9	1,08	0	0	6,3
E87	1,5	0	2,97	0,6	0	1,08	0	0	6,2
E823	0,75	0	1,35	0,6	0,45	0,54	2,4	0	6,09
E278	1,5	0	1,08	1,2	0	1,08	1,2	0	6,1
E725	1,5	0	0,54	0	1,58	0	2,4	0	6,02
E85	1,5	0	0,54	0	0,45	1,08	2,4	0	6,0
E884	0,75	0	2,16	2	0,45	0,54	0	0	5,9
E772	0,75	0	0	0,6	0,45	1,35	1,2	1,5	5,85
E923	0	0	2,16	0,6	0	1,08	0	0	3,84
E727	1,5	0	0,54	0,6	0,45	0,54	0	0	3,63
E257	1,5	0	0	0,6	0	0	1,2	0	3,3
E294	0,75	0	0	0	0	0	2,4	0	3,2

Source: Reserarch data.

Thus, the minimized logical equation is clarified. According to Rihoux and De Meur (2009), superfluous conditions exist that can be removed from the complete initial expression, thereby producing a shorter expression., which is known as a "prime implicant" , that is to say, a minimized logical equation. . Thus, with the help of the Tosmana programme, we selected the option to exclude the remainders logics in order to reach a reduced expression with greater rationality (Table 4). By using the remainders resources, it was possible to remove unobserved combinations in empirical cases or those that could be described by a much lower logical expression (Booleana minimization). So, these superfluous combinations were excluded with a minimization process. The findings of the Booleana Algebra, as seen in Table 4, shows the following logical equation:

Organization {1} + Clients {1}* Supply {1}

This expression can be read in the following way: i) the presence of the 'Organization' dimension or a combination of the presence of the 'Client'dimension and the presence of the 'Supply' dimension lead to the presence of a successful company performance, that is to say, a dictomized outcome such as 1 (one).

Table 4: Innovation dimensions test to explain QCA company Performance (with minimization).

Tosmana Report
Algorithm: Graph-based Agent
Settings:
    Minimizing Value   1
    including   R
Truth Table (The variables are the Radar of Innovation dimensions)):

v1: Supply	v2: Plataform	v3: Brand	v4: Clients	v5: Solutions
v6: Relationships	v7: Added value g	v8: Procedures	v9: Organization	v10: Supply chain fornec.
v11: Presence	v12: Network	v13: Innovative environment		
O: Company performance MSB)	id: Companies			

v1	v2	v3	v4	v5	v6	v7	v8	v9	v10	v11	v12	v13	O	id
1	1	1	1	1	1	1	0	1	0	1	1	1	1	E119, E150
1	1	1	1	0	1	0	0	0	0	0	1	0	1	E123
0	1	1	0	1	1	0	1	1	0	0	1	1	1	E449
1	1	1	0	0	1	1	0	1	0	0	1	1	1	E460
1	1	1	1	1	1	1	0	1	1	1	1	1	1	E100, E105, E112, E115, E120
1	1	1	0	1	1	0	0	1	1	1	1	0	1	E172
1	1	1	0	0	1	0	0	1	0	0	1	1	1	E464
1	1	1	1	0	1	0	0	1	1	1	1	0	1	E199, E200
1	1	1	1	1	1	0	1	1	1	1	1	0	1	E124
0	1	1	1	1	1	0	0	0	0	0	1	0	0	E691
1	1	1	0	1	1	0	0	0	0	0	0	0	0	E902
0	0	1	0	0	0	0	0	0	0	0	0	0	0	E58
0	1	1	0	1	0	0	0	0	0	1	0	0	0	E317
1	1	1	0	0	1	0	0	0	0	0	0	0	0	E87
0	1	0	0	0	0	0	0	0	0	1	0	0	0	E85
0	0	0	0	0	0	0	0	0	0	1	0	0	0	E278
0	0	0	0	0	0	0	0	0	0	0	1	0	0	E725
0	1	1	0	0	0	0	0	0	0	0	0	0	0	E823
0	1	0	0	0	0	0	0	1	0	1	0	0	0	E884
0	1	1	0	1	0	0	0	0	0	0	0	0	0	E257
0	0	0	0	0	0	0	0	0	0	0	0	0	0	E294
0	0	0	0	0	1	0	0	0	1	0	1	0	0	E727
1	0	0	0	1	0	0	0	0	0	0	1	0	0	E772
1	1	0	0	0	0	0	0	0	0	0	0	0	0	E923

Result: (all)
    Organization {1} + Supply {1}Clients{1}
    (E119,E150+E449+E460+E100,E105,E112,E115,E120+E172+E464+E199,E200+E124) (E119,E150+E123+E100,E105,E112,E115,E120+E199,E200+E124)

Source: Created with Tosmana (Version 1.302) software with this research data.

In order to certify the validity of this equation, we proceeded to apply a test to a wider set of case studies, including the following four cases which showed the best and worst company performances, which involved a deliberate selection of a total of 38 of the most notable cases. This new sampling showed the same minimized logical equation outcome.

These findings showed that the presence of the 'Organization' innovation dimension is sufficient in itself, but not needed to influence company performance, since success can also be achieved through the presence of the 'Clients' and 'Supply' dimensions. Both dimensions (Clients{1}*Supply {1}) are necessary for company performance success, but not sufficient in themselves just because one of these (in an isolated form) does not influence a successful outcome.

The output of the minimized equation reveals that there are different forms of expressing the causal complexity that is capable of leading to the desired outcome, which is herein acknowledged as a dependent variable (company performance). Thus, it is our understanding that fairness is expressed by the fact that more than one sufficient condition can exist, though is not necessary to reach an outcome. This represents a typical case, as presented by Wagemann (2012).

A distinction between the regression and the QCA outcomes should be established. . Wagemann (2012) highlights that, in a straight regression line, for example, the independent variables are not alternative, since all of these contribute a certain percentage to explain the phenomenon. On the other hand, in the QCA fairness, causal conditions behave as "components" with which a complex causal relationship can be modelled.

In addition, there is a conjunctival causality that, in the current research work, implies that a condition in itself is not sufficient to generate company performance, since it should exist in order to be combined in the context of more than one variable. In this respect, the 'Supply' variable should be highlighted, the isolated analysis of which does not show any influence on the multiple Regression performance. However, when the two dimensions 'Supply' and 'Clients' are combined, we have the necessary conditions to achieve company performance. That is to say, the 'Clients' variable needs to be combined with the 'Supply' variable, with the conjunctival causality concept, in order to generate successful company performance.

5. Discussion, Conclusions, Limitations and Recommendations

The Radar of Innovation has been used in various research studies in Brazil, as shown by research undertaken by Bichueti et al. (2013); Capeleiro (2013); Carvalho et al. (2015), Cunha et al. (2015) and Paredes et al. (2014); Silva and Araújo (2014); Souza and Heinzmann (2014). This happened because, from this, it was possible to carry out research about Micro & Small Businesses innovation in Brazil. Since the academic community is interested in its application, this would be enough to put it to the test. However, since we set out with the assumption that innovation should lead to a higher performance, be this in a large company (Schumpeter, 1934) or in a Micro & Small Business (Gomes & Wohjan, 2017; Marín-Idárraga & Cuartas-Marín, 2019), we tested this factor by having the performance variable as a dependent. Thus, one of the contributions that we can make with our research work is to test the impact that innovation has on the performance of small businesses.

Our study shows that of the 13 dimensions that are recognized in the Radar of Innovation as catalyzers of innovation, those that effectively influence Micro & Small Businesses performance in the sampling are: Added value, Innovative environment, Clients, Brand, Organization, Presence and Procedures. . With this, we show that the Radar of Innovation can be a useful took to understand performance based on innovation

in small businesses.   According to our understanding, the dimensions of the Radar of Innovation come close to the innovations prescribed by OECD (2005): Innovative environment (organization and procedures); Clients (the Market); Brand (the product); Organization (procedures and organization); Presence (Market and procedures); and Processes (procedures). We also highlight the fact that, even those that do not exert such influence may be characterized with the OECD classification (2005). This is another contribution that our research has to offer, since we associate the Radar of Innovation proposed by Sawhney, *et al.* 2006 and extended by Bachmann and Destefani (2008), with the previous classification, carried out by OECD (2005).

We can see that the Supply dimension did not impact on performance (Table 2), but is capable of explaining performance by means of the Clients dimension.   This reinforces the point at the beginning of the discussion about technological innovation, as proclaimed by OECD (2005). Thus, at least from the point of view of regression, it is important what is done as a result of inspired ideas received from clients, and this is apparent in several diferente forms, as we can see in Table 2.

Among the dimensions described by Bachmann and Destefani (2008), Carvalho et al. (2015) and Sawhney, *et al.* 2006, resources does not appear in the Radar of Innovation. Thinking from a strategic point of view, terms of relevance weigh less in a discussion such as that about knowledge. In particular, this resource appears as a performance inducer (FNQ, 2014 & SEBRAE, 2016), innovation leading to performance (Marín-Idárraga & Cuartas-Marín, 2019), but in the Radar, knowledge does not have a direct relationship with innovation. In our view, this is a limitation of the Radar of Innovation and, consequently, represents another contribution that our study provides.

With the QCA findings, we see that three dimensions – Organization, Clients and Supply – are presented as being sufficient and/or necessary conditions for attaining a high level of company performance in the sampling data. . High performance is manifested in Micro & Small Businesses which use sound practices associated with Organization, such as new partnerships, competitive strategy changes or the reorganization of company activities, provided that these are carried out in conjunction with the use of Client practices, such as identifying new client needs, using client suggestions to form the basis of new products. . Our attention was drawn to the use of sound practices in Supply in Micro & Small Businesses, as seen, for example, with changes made to products in order to meet environmental issues, changes in design or the launch of new products, which can only generate a high level of performance when combined with sound practices associated with Clients. However, what we are seeing is the fact that, in the Radar, this dimension does not have very well defined boundaries.. We see this as another contribution resulting from our work. .

The findings of the regression test and the QCA are the same. However, we understand that the Micro & Small Businesses that attain a high level of performance in the market are those that are capable of organizing themselves internally and able to meet the needs of their clients, which is a basic condition to ensure that their supply should, in fact, be capable of increasing their performance. In a certain way, the dimensions evaluated by Garengo et. al. (2005) also try to capture this dynamic.

In Micro & Small Business that have a low level of organization and a low customer prientation, sound practices in terms of supply do not increase their performance. However, it seems that what we are showing is the same as described by Mintzberg (1973), almost 50 years ago: focusing on opportunities – the market – and internal flexibility – organization, are sources of competitiveness for small businesses.

According to Rosenbusch et. al. (2011), performance is multidimensional. In the Works of Gomes e Wohjan (2017); Marín-Idárraga and Cuartas-Marín (2019), it was shown that innovation leads to a higher level of performance in Micro & Small Businesses. As another contribution of our work, we went one step further, proving that the fact that

having some dimensions that compose innovation in an integrated manner (Sawhney et al., 2006) is already enough to positively impact on the performance of small businesses.

Our findings also reveal that the Radar of Innovation methodology includes variables which, in consequence, influence company performance – but these variables do not derive from a holistic approach, as initially described by Sawhney et al. (2006). In effect, the three practices presented in the logical equation derived from the QCA are typically intra-firm in scope, in accordance with the premise put forward by Schumpeter (1934), but which are not practices associated with the performance of Micro & Small Businesses in a systematic perspective, such as the practices contained in the Radar of Innovation, such as Network, Relationships or Supply Chain.

Our study presents limitations. The first of these is the fact that we have only included companies located within the Federal District of Brasilia. Even though this sampling represents a relatively high level of reliability (97%), these findings may be subject to some form of territorial effect. Thus, a recommendation for future study would be to use data from other localities.

The choice of companies included in the QCA study was intentional, for the application of the *crisp sets technique.* . A random test of these dimensions should therefore be carried, taking into account the a *fuzzy set technique.*

Among recommendations for future studies, we would like to highlight the replication of this study in order to obtain confirmatory evidence about the non-manifestation of variables typically associated with innovation systems such as company performance predictors for Micro & Small Businesses. In addition, we recommend a manifestation test of the Management Excellence Model (MEG) dimension itself using a new sampling of Micro & Small Business so that these may generate support for the model in the context of the business sector.

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