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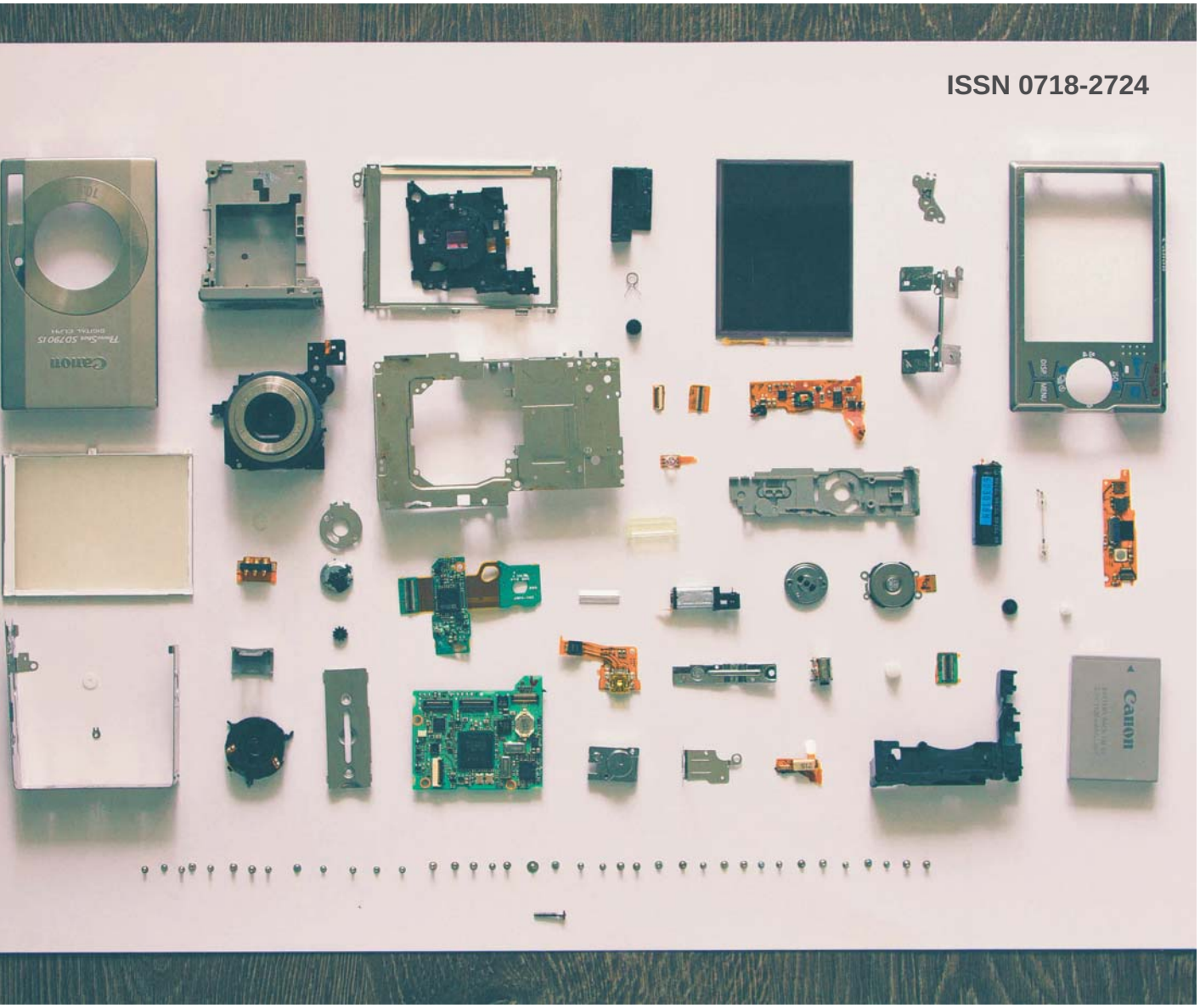

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Research Articles

Case Studies

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The Value of Being Innovative in Information Technology

Rodrigo Fernandes Malaquias [1, 2 *]; *Alberto Luiz Albertin* [1]

Abstract: We developed this paper in order to better understand the effects of being innovative in the use of Information Technology (IT). Through a measure for listed companies that are innovative in IT use, we developed a quantitative analysis considering the investments made by institutional investors in these companies. As institutional investors, the sample includes observations from 2,880 mutual funds, since managers of these funds are presumed to be experts in choosing good companies to invest financial resources. Regarding the companies' stocks, the final sample of this study is comprised of 592 observations during the period from 2013 to 2015. The main result obtained in this paper indicates that "innovative companies in IT use" receive more investments from institutional investors when compared with the other firms. These results are robust to other variables presented by academic literature as relevant factors to understand resources allocation in financial market.

Keywords: IT investments; Latin America; Stock Market; Strategy; Brazil.

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Introduction

Considering the resource based theory (Barney, 1991; Barney et al., 2011), we can state that firms must seek for competitive advantages to reach better results and outperform their competitors. The adequate use of tangible and intangible assets of the firms can create competitive advantage (Barney et al., 2011). In this regard, IT investments have an important role for companies' performance (Bharadwaj, 2000), especially when firms foresee, explore and keep relationship infrastructure and organizational learning (Bhatt & Grover, 2005). It is important to note, however, that just becoming a successful firm in the present does not guarantee that this success will be sustainable in the future (Su & Linderman, 2016). Thus, just invest in IT seems to be not enough to achieve better performance, but being innovative in IT use will represent a competitive advantage. "Executives have been always interested in R&D's contribution to the firm's competitive advantage" (Chiesa et al., 2009, p. 26).

According to Spelta and Albertin (2012, p. 49), "large firms are dependent on IT (to a greater or lesser degree, depending on the industry), both for everyday operations and for the implementation of their business strategies". Considering that some large firms can use IT resources better than their counterparts, what is the value of this differential use of IT? At least, the response for this question can be given in two ways: first, in the company's managerial point of view; secondly, in the point of view from external stakeholders and shareholders. This paper focuses on the value of IT use for shareholders that do not participate directly in the management activities of the firms in which they invest.

Due the relevance of IT investments to the future performance of the firms, investors of listed companies should react to information about new investments. These new investments can positively affect companies' performance and may generate positive outcomes through dividends and capital gains. The value of IT use, in this scenario, was already explored by previous research. For example, Mahmood and Mann (1993) did not find a bivariate strong relationship between IT investment and organizational performance measures, but the authors proposed a theoretical framework that considers implications for market value of the firms due IT investments. Sircar et al. (2000) also included in their quantitative model a variable to represent the stock market, namely the average daily stock closing price.

In the stock market, there are different kinds of investors, such as small individual investors, large individual investors, foreign investors, institutional investors, among others. Despite all these investors are interested in positive gains with their active management, institutional investors are presumed to be better informed and experienced to act in this market and obtain positive returns. Considering the relevance of these investors to the stock market of a given economy, we found a gap in the literature about their reaction to the innovative use of IT by listed firms. Based on this context, **the aim of this paper is to analyze the extra amount of financial resources invested by mutual funds (as institutional investors) in companies that are innovative in IT use**. To do so, our sample is comprised of listed companies, since all information about their characteristics are public available.

We develop our empirical analysis using data from Brazil, an emerging economy with relevant participation in Latin America. In this market, the speed in which the price of shares reacts to new information disclosed by companies tends to be lower than it is in other developed countries, such as the United States of America. Thus, it is important to analyze some characteristics of companies that institutional investors rely on to make their investment decisions. This relevant information, in the case of this paper, is the innovative use of IT. Moreover, there are inequalities in the access of basic

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resources related to information technology in the region of Latin America (Malaquias & Albertin, 2018), which contributes to the relevance of analyzing the innovative use of IT in a country of the region.

The results found in this research are relevant for Brazil and for other emerging economies, especially for those with the same level of market efficiency (Fama, 1970; 1991). We show that innovative use of IT is perceived by investors as a good sign regarding listed companies. An innovative behavior is a relevant factor for contemporary organizations (Omri, 2015); therefore, institutional investors seem to be willing to buy and keep shares of companies that are innovative in IT use to obtain better performance. Considering that "research on firm resources and capabilities has attracted increasing interest in the past several years" (Helfat, 2000, p. 955), and the increasing of attention to understand the relationship between IT capabilities and firm performance (Santhanam & Hartono, 2003), the evidence reported in this paper can expand and contribute with the studies about IT capabilities and its potential consequents.

Theoretical Model

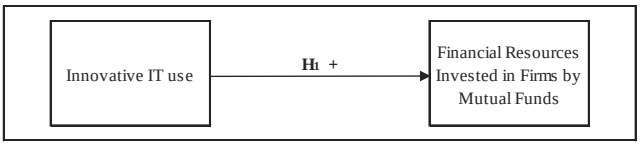
Grounded on the resource based theory (Barney, 1991; Barney et al., 2011), firms must to outperform their competitors using alternatives which are difficult to replicate by them. IT helps firms in this process, but it is also important to highlight that "adopting a resource-based perspective of IT, researchers have argued that since investments in IT are easily duplicated by competitors, investments per se do not provide any sustained advantages" (Bharadwaj, 2000, p. 170). The resources associated with IT involve the following items (and the interaction between them): IT infrastructure, IT business experience, human IT resources, and IT-enabled intangible resources (Bharadwaj, 2000; Bhatt & Grover, 2005).

"A particular IT capability cannot on its own produce work efficiencies, cost savings, and sales growth because people in the organization ultimately determine the design and use of that system to achieve collective ends" (Nakata et al., 2008, p. 486). Therefore, IT, per se, does not necessarily represents a capability; but managing IT adequately can represent a capability (Bhatt & Grover, 2005) and create competitive advantage.

Investments in information technology improve organizational efficiency and competitiveness (Kohli & Devaraj, 2003) and deliver strategic impacts (Tallon et al., 2000); IT investments can also improve the performance of partnerships of collaborative works (Chang et al., 2015) and support the development of supply chain agility (Liu et al., 2013). "A flexible IT infrastructure also leads to a high level of supply chain agility. First, the connectivity of IT components helps the firm consolidate information flow with channel partners using an integrated technological interface" (Liu et al., 2013, p. 1455). Nakata et al. (2008) state that IT capability contributes to firms' performance, but this path is not necessarily direct, and the arguments previously presented indicates some contributions that firms can obtain from adequate investments in IT. Considering that innovative behavior has a positive effect on business performance (Omri, 2015) and that product innovations are also important to improve performance (Löfsten, 2014), our arguments indicate that an innovative use of IT creates value for firms. Figure 1 summarizes the research hypothesis of this paper:

H1: institutional investors positively evaluate companies that present an innovative IT use.

Figure 1: Research model. Notes: Innovative IT use = represents firms that are innovative in IT use; Financial Resources Invested in Firms = the amount of financial resources invested in listed companies by institutional investors.



In the financial market, there are different types of actors taking investment decisions, such as individual investors, institutional investors, foreign investors, among others. We chose to analyze in this paper the potential effects of being an innovative company (in the use of IT) on the decisions taken by mutual funds, when they choose firms to allocate their financial resources. Our analysis can indicate another factor that should be relevant to be considered in quantitative models that address the financial market, as well as indicate the perception regarding IT benefits for institutional investors (mutual funds, in the case of this study), which are specialized in stock selection.

The body of literature that explores the behavior of the stock market is large and considerable. Fama and French (1993) identified three relevant risk factors in the returns of stocks, which are: an overall market factor, a factor related with size and a factor related with book-to-market equity. Recently, Fama and French (2015) observed that a five-factor model can explain better the variations in stocks, when compared with the three-factor model. The additional factors are related with profitability and investment patterns of the companies. The momentum factor presented by Carhart (1997) is also usually combined with the Fama and French (1993) factors to analyze the performance of stocks/funds in the financial market. In this paper, we explore an additional factor that can be used to understand the behavior of the stock market and the reaction of investors to innovative investments made in IT. Nevertheless, we consider the previous factors indicated by literature as control variables, in order to analyze the robustness of this new factor (being innovative in IT).

Method

The first step to develop this research was to identify the portfolio composition of Brazilian mutual funds. We selected this information from Economatica database. "The Economatica System is used by thousands of analysts following Latin America's stock markets, government bonds, the fund industry and various indicators" (Economatica, 2016). We found 2,880 different investment funds (mutual funds) with available information to develop this research (considering the years of 2013, 2014 and 2015, as we will explain in the following paragraphs).

The dependent variable of this research is the amount of resources that all mutual funds have invested in each listed firm at the end of each year of analysis. In Equation 1 we highlight how we calculate this variable.

$$Res_{j\,t} = \sum_{i=1}^{n} (Res_{i\,j\,t}) \quad (1)$$

Where: Res i j t = the amount of financial resources (%) that the fund i has invested in firm j at the end of year t; Res j t = the amount of financial resources (%) that all funds (from i =1 to i = n) have invested in firm j at the end of year t.

In order to avoid scalar problems in the quantitative tests, we also calculated the natural logarithm of the variable "Res". Therefore, for the purpose of robustness check, we also generate the variable Res(ln), as we present in Equation 2.

$$Res(ln)_{j\,t} = ln(1 + Res_{j\,t}) \quad (2)$$

Where: Res j t = the amount of financial resources (%) that all funds (from i =1 to i = n) have invested in firm j at the end of year t; Res(ln) j t = the natural logarithm of the variable "Res". We add "1" because there are some observations in which the total of financial resources is zero.

Then, we selected all listed Brazilian companies available in the portfolio of the investment funds. We used Equations 1 and 2 to estimate the percentage of aggregate portfolios invested in each firm, each end of year (2013, 2014 and 2015). This information was recorded in an electronic spreadsheet.

The second stage was the selection of Brazilian listed firms with available information to calculate the factors that academic literature indicate as relevant to understand the behavior of stock market (Fama & French, 1993; 2015; Carhart, 1997). We excluded of the sample companies with the absence of value for one of these variables, and we also excluded companies of the finance sector, because the operations of this industry are usually different of the other companies. Therefore, based on previous literature (Fama & French, 1993; 2015; Carhart, 1997), year by year, we create (the breakpoint is the median):

i) a group of small and a group of big firms, based on their market values;

ii) a group of firms with low liquidity in the stock market and a group of firms with high liquidity (in Brazil, the main stock index, called Ibovespa, is composed by the most liquid firms, and this index is usually adopted as a measure for the Brazilian capital market);

iii) a group of firms with low Book Equity / Market Equity (BEME) ratio, and a group of firms with high BEME ratio;

iv) a group of firms with low average past returns of stocks and a group of firms with high average past returns of their respective stocks;

v) a group of firms with low investment levels (which is the difference of total net assets of the year t+1 minus the total net assets of year t, divided by the total net assets of year t) and a group of firms with high investment levels. It is important to note that these investments were not necessarily made on IT; they are general investments in assets made by companies;

vi) a group of firms with low profitability indexes and a group of firms with high indexes of profitability.

These groups were create to check the robustness of the quantitative analysis of H1, since these factors are already available in current literature as important risk factors to understand the behavior of stock market.

After creating all these groups, we had the information of the company's name and its respective group, each year. We combined this information with the first database created in the first step of this study. Therefore, our database contains information of the company's name, its respective group and the amount received by institutional investors.

Finally, we have selected a list of innovative companies in IT. We obtained this list considering the ranking of the 100+ innovative in IT Use (IT Forum, 2013; 2014; 2015). "The 100+ Innovative in IT Use award, conducted in partnership with PwC, contextualizes innovation governed by the largest companies in Brazil by combining process versus practice in the use of technology for the benefit of business innovation" (IT Forum, 2016). In our database, we created a dummy variable, where a given company in a given year receives 1 if it is ranked in the list of 100+ innovative in IT, and 0 otherwise.

Results

We elaborate Table 1 to report some characteristics of the sample, specifically regarding the amount invested in each company of the sample by institutional investors (mutual funds) and the number of companies that received score 1 in the dummy variable of 100+ Innovative in IT use. There are companies in the sample that receive a great attention from mutual funds, because the aggregate amount of portfolio holdings allocation that they have received is high. The average amount is 263.9%; on the other hand, there are some firms that did not receive any allocation from institutional investors during this period, as Table 1 also indicates.

Table 1: Descriptive statistics of data. Notes: Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; Res = the amount of financial resources that all funds have invested in firm j at the end of year t; Res(ln) = natural logarithm of the variable "Res".

Variable	n	mean	s.d.	min.	max.
Inv(IT)	592	0.081	0.273	0.000	1.000
Res	592	263.979	619.870	0.000	5,141.356
Res(ln)	592	3.986	2.129	0.000	8.545

The other variable created to represent the amount of financial resources invested in each company has a low variation in comparison with the original measure (low standard deviation compared to the mean). Our sample study contains 592 observations from companies during the period from 2013 to 2015, and, as we commented before, there are some cases with high amount of investments, but others received zero. In order to explore these allocations with more details, we segregate the database considering companies ranked in the list of the "100+ Innovative in IT use" and companies that are not in this list. Table 2 contains the results and the hypothesis test. Table 3 contains equivalent information, but the dependent variable is the natural logarithmic of the total amount invested in each company, as we explained in the methodology section.

The information reported both in Tables 2 and 3 indicate that companies listed at the 100+ Innovative in IT use [Inv(IT)=1] received more portfolio allocations from institutional investors. According to Table 2, this amount is more than the quadruple of the amount invested in the other firms. These evidences indicate that H1 is supported. Therefore, it is an indicative that institutional investors, who are presumed to be informed participants in the financial market, give attention to innovative firms in the use of IT.

Table 2: The effect of IT use on the amount of financial resources invested in firms - dependent variable: Res. Notes: Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; Res = the amount of financial resources that all funds have invested in firm j at the end of year t; Res(ln) = natural logarithm of the variable "Res".

Variable	n	mean	s.e.	t	sig.
Inv(IT) = 0	544	200.970	18.208	-8.854	0.000
Inv(IT) = 1	48	978.071	213.174		

Table 3: The effect of IT use on the amount of financial resources invested in firms - dependent variable: Res(ln). Notes: Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; Res = the amount of financial resources that all funds have invested in firm j at the end of year t; Res(ln) = natural logarithm of the variable "Res".

Variable	n	mean	s.e.	t	sig.
Inv(IT) = 0	544	3.909	0.087	-3.005	0.003
Inv(IT) = 1	48	4.865	0.412		

To test the robustness of the results obtained in this paper, we considered the relevant factors also presented by financial literature that can affect the resources allocations of institutional investors in financial market (Fama & French, 1993; Carhart, 1997; Fama & French, 2015). As we explained in the method section, the factors we used in these robustness checks were: the size of listed firms; the difference between book equity value and market value; the profitability of firms; the past stock returns of the firm; the investments level. We also analyzed the liquidity of the firms. These results are available in Appendices from A to F.

According these additional analyses, we observed that being a company with innovative use in IT represents a relevant characteristic not only to be available in the portfolio composition of institutional investors, but also these companies receive higher percentage of investments from these investors. For example, according to Appendix C, for a subset of companies with higher difference between book equity and market equity (High BEME), innovative firms receive a large amount of resources (1,391.2, on average) when compared with the other firms (145.6, on average); on the other hand, in the subset with lower difference between book equity and market equity (Low BEME), innovative firms also receive higher amounts of resources (528.9, on average) than the other firms (255.8, on average). In this way, even considering previous factors presented as relevant by academic literature, the characteristic of being an innovative company in the IT use represents a relevant information to institutional investors.

Final Remarks

Information Technology contributes with the value added by firms, especially through the combination of internal resources and their adequate management as a valuable resource. Considering the resource based theory (Barney, 1991; Barney et al., 2011), firms should use IT capabilities to achieve competitive advantage with resources that are difficult to imitate. The effects of IT capabilities on firm's performance are not necessarily direct (Nakata et al., 2008), but the information regarding some companies which are innovative in IT use can indicate that those firms present better chances of being successful firms to make financial investments. We developed this paper considering this context, and we have analyzed the value of being innovative for a specific kind of investors: mutual funds, institutional investors with specialized knowledge in stock selection.

The study sample comprises 592 observations from listed firms, during the years from 2013 to 2015. The dependent variable is the percentage of mutual funds' portfolios invested in each firm, and the sample includes portfolio data of 2,880 Brazilian mutual funds. We observe with the analysis of this paper that the information regarding being an innovative firm in the use of IT seems to be a relevant factor for institutional investors to take decisions regarding portfolio allocation. The dichotomous of the main independent variable (being innovative in IT use) has some limitation; nevertheless, it is important to highlight that this simple measurement of being an innovative firm has a significant effect on the financial market. Furthermore, this result is robust when compared with previous factors already studied by academic literature on stock market. Information on other kind of assets (such intangible assets) are also relevant to explain the attractiveness of stocks, but this information should already been captured by the other factors previously studied, specifically the factor investments levels (Fama & French, 2015; tests in Appendix E). Even considering these factors, the results of the dichotomous variable were statistically significant in this paper.

Other studies already have evaluated the value of IT, for example, considering executive's perception, and found a positive effect of IT spending on business goals (Tallon et al., 2000), and the value of IT

to firm's market value (Mahmood & Mann, 1993; Sircar et al., 2000). This paper confirms the relevance of IT investments, reinforces the positive effects that these investments have on investors' perception, and expands previous research using a new avenue to analyze the relationship between IT and the value of these investments. Managers need to manage the complexities related with product innovation, as well as they need to pay attention to the relationship between product innovation and business performance (Löfsten, 2014). The results of this paper indicate that this management is expected to present a positive effect on performance forecasting from institutional investors.

Additionally, the results of this paper have implications for the strategy literature, since IT investments are related with capabilities and strategic planning. Firms committed with long term goals and that have care to align their internal resources and create competitive advantages tend to overcome their competitors. The strategic use of IT has a positive effect in this regard; when some firms present an innovative way of IT use, it can represent a good sign to the financial market about the potential benefits (and positive results) of this choice, made by companies' managers. Our paper indicates strong evidences that corroborates with this reasoning.

The main limitation of this paper is the consideration of only listed companies with data available for all variables included in the quantitative models, such as the size of the firms, their BEME indexes, their past stock returns and the proxies for new investments and profitability. Despite the inclusion of these variables represent a limitation of the database, in terms of the number of firms with complete information, these variables allow us to evaluate the robustness of the results considering some important factors previously studied by academic literature. Another limitation is the consideration of the portfolio composition of mutual funds, since there are other institutional investors that also operates in the Brazilian financial market (such as the multimarket funds). This limitation indicates some opportunities for new studies, for example, comparing the value of being innovative among different types of institutional investors that operates in the same emerging economy.

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Appendices List

Appendix A:
The effect of IT use on the amount of financial resources invested in firms, by Size

Group	Variable	n	mean	s.e.	t	sig.
Small	Inv(IT) = 0	290	78.466	6.599	1.640	0.102
	Inv(IT) = 1	6	3.085	1.955		
Big	Inv(IT) = 0	254	340.837	36.360	-5.942	0.000
	Inv(IT) = 1	42	1,117.354	236.115		

Notes: Small = 50% of the companies in the sample with the smallest market values; Big = 50% of the companies in the sample with the highest market values; Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; dependent variable: Res = the amount of financial resources that all funds have invested in firm j at the end of year t.

Appendix B:
The effect of IT use on the amount of financial resources invested in firms, by liquidity level

Group	Variable	n	mean	s.e.	t	sig.
Low Liq.	Inv(IT) = 0	284	57.154	4.841	2.353	0.019
	Inv(IT) = 1	12	1.640	1.033		
High Liq.	Inv(IT) = 0	260	358.062	35.267	-6.971	0.000
	Inv(IT) = 1	36	1,303.548	263.169		

Notes: Low Liq. = 50% of the companies in the sample with the smallest liquidity indexes in the stock market; High Liq. = 50% of the companies in the sample with the highest liquidity indexes in the stock market; Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; dependent variable: Res = the amount of financial resources that all funds have invested in firm j at the end of year t.

Appendix C:
The effect of IT use on the amount of financial resources invested in firms, by BEME index

Group	Variable	n	mean	s.e.	t	sig.
Low BEME	Inv(IT) = 0	273	255.852	27.587	-2.612	0.010
	Inv(IT) = 1	23	528.957	152.019		
High BEME	Inv(IT) = 0	271	145.684	23.312	-9.263	0.000
	Inv(IT) = 1	25	1,391.255	369.503		

Notes: Low BEME = 50% of the companies in the sample with the smallest BEME indexes; High BEME = 50% of the companies in the sample with the highest BEME indexes; Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; dependent variable: Res = the amount of financial resources that all funds have invested in firm j at the end of year t.

Appendix D:
The effect of IT use on the amount of financial resources invested in firms, by Past Stock Returns

Group	Variable	n	mean	s.e.	t	sig.
Low Ret.	Inv(IT) = 0	267	222.754	29.479	-8.082	0.000
	Inv(IT) = 1	29	1,335.398	321.747		
High Ret.	Inv(IT) = 0	277	179.973	21.689	-2.722	0.007
	Inv(IT) = 1	19	432.677	163.177		

Notes: Low Ret. = 50% of the companies in the sample with the smallest past stock returns during the year; High Ret. = 50% of the companies in the sample with the highest past stock returns during the year; Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; dependent variable: Res = the amount of financial resources that all funds have invested in firm j at the end of year t.

Appendix E:
The effect of IT use on the amount of financial resources invested in firms, by Investment levels

Group	Variable	n	mean	s.e.	t	sig.
Low Inv.	Inv(IT) = 0	279	144.878	17.353	-5.740	0.000
	Inv(IT) = 1	17	726.735	303.454		
High Inv.	Inv(IT) = 0	265	260.026	32.252	-6.343	0.000
	Inv(IT) = 1	31	1,115.900	285.511		

Notes: Low Inv. = 50% of the companies in the sample with the smallest investment levels; High Inv. = 50% of the companies in the sample with the highest investment levels; Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; dependent variable: Res = the amount of financial resources that all funds have invested in firm j at the end of year t.

Appendix F:
The effect of IT use on the amount of financial resources invested in firms, by Profitability

Group	Variable	n	mean	s.e.	t	sig.
Low Profit.	Inv(IT) = 0	273	154.626	23.898	-10.697	0.000
	Inv(IT) = 1	23	1,635.198	390.280		
High Profit.	Inv(IT) = 0	271	247.657	27.253	-1.325	0.186
	Inv(IT) = 1	25	373.514	103.100		

Notes: Low Profit. = 50% of the companies in the sample with the smallest profitability indexes; High Profit. = 50% of the companies in the sample with the highest profitability indexes; Inv(IT) = dummy variable, which receives 1 if the firm in the year t is listed in the 100+ innovative firms in the use of Information Technology; dependent variable: Res = the amount of financial resources that all funds have invested in firm j at the end of year t.

Determinants of Social Media Adoption by Large Companies

Felipe Bogea[1], Eliane Pereira Zamith Brito[1]*

Abstract: Social media marketing has become a central issue for companies and marketers. Few studies have, however, specifically researched factors and barriers influencing the adoption of social media at company level. This study addresses this gap by focusing on furthering the theory involved in the adoption social media at company level. Based on the findings of semi-structured in-depth interviews with 17 marketing executives of large companies in Brazil, six variables that weigh in the adoption of social media were identified: the demonstrability of the results, the customers' presence on Social media, knowledge of social media, stakeholder influence, common sense as related to digital marketing and the executive's age. Additionally, we propose a theoretical model of social media adoption, in the light of the Technology Acceptance Model (TAM).

Keywords: social media adoption; social media marketing; technology adoption; TAM

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Introduction

Social media is a general term employed to describe several web-based platforms developed for individuals and communities to share information and opinions and to co-create content (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011). The mass adoption of social media by individuals has increased consumer power which, in its turn, has pressured companies into adopting and managing social media communication (Sinclaire & Vogus, 2011). Its increasing relevance has influenced companies to allocate more investment to create or promote companies' brands and content rapidly through social media marketing efforts. Thus, social media has become a central issue for companies and marketers (Kumar, Vikram, Mirchandani, & Shah, 2013).

For Dahnil, Marzuki, Langgat, & Fabeil (2014), the increasing trend towards the use of social media by companies offers a clear research opportunity. For those authors, it is fundamental to understand the factors that encourage the adoption of social media marketing among companies. For Kuikka and Akkinen (2011), there is a vast literature on the barriers faced at company level by organizations adopting a new enterprise system but there are very few studies that have undertaken research specifically into the adoption and use of social media. Moreover, before practical guidelines to support managers can be defined, the overall phenomenon of the adoption of social media requires more research and calls for more empirical evidence (Jobs & Gilfoil, 2014).

On a broader perspective, the implementation of new internet-based technologies has been identified as a relevant process for moving a company toward electronic business. In this sense, business attitudes regarding the adoption of internet-related innovation have been acknowledged as a critical factor for executing e-business strategy. There is limited research on the adoption of business-level technology as compared to research examining the adoption of individual-level technology (Yu & Tao, 2009).

The present research will draw on the TAM proposed by Davis (1989) to understand company level adoption of social media. Since its conception in 1989, TAM has become accepted as a solid and parsimonious model for predicting user adoption in a variety of contexts (Venkatesh & Davis, 2000). Although TAM is a robust model, increasing knowledge of the determinants of perceived usefulness (PU) and perceived ease of use (PEOU) it would allow practitioners and academics to better design and implement managerial actions that would increase the user's adoption of new systems (Venkatesh & Davis, 2000; Yu & Tao, 2009).

The aim of this research is to further the theory of social media adoption at company level and the theory underlying the adoption of new technologies. The research question is: what are the factors and their influence on the adoption of social media by large for-profit companies?

This research contributes to theory in two ways: (i) it furthers knowledge of the factors influencing the adoption of social media, and (ii) it develops a theoretical model to explain the adoption of social media, within the perspective of TAM.

Within a managerial perspective, this research is relevant for social media technology providers, for marketing agencies and for marketing executives. For the technology providers, it can show what barriers and concerns they may need to tackle to increase the adoption of their platforms. For the agencies and marketing executives, it contributes to an understanding of the factors that influence adoption and employment of new marketing tools, which can lead to better decisions for social media marketing.

This study is structured in five sections. The first section introduces the theme and describes its importance. In the second, there is a theoretical review of the adoption of social media at company level, and of TAM. The third section describes the methodology employed. In the fourth and fifth sections, the results are presented and discussed.

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Theoretical Background

Social Media Adoption

Research into the adoption of social media by companies is a recent research subject on which there are few studies. The existing literature has studied different aspects of social media adoption. It is possible to identify three main topics researched: (i) the level of adoption of social media by a certain group of organizations; (ii) the factors and barriers influencing adoption; (iii) the adoption process at company level – stages of adoption. This study and literature review will focus on the factors involved in such adoption and the barriers which hinder it.

Dahnil et al. (2014) identified five groups of internal and external factors that could affect the adoption of social media marketing. The first group of factors is related to the end users themselves: training and knowledge of the social media environment and perceived usefulness. The second group is related to organizational resources: whether top management has allocated resources in terms of money, time and personnel, to social media marketing. The third is related to the technological limitations of the platforms. For example, the difficulty involved in the measurement of business results. The fourth factor group is related to the company's leader's attitude towards social media. Lastly is the business environment. In this group, competitors' behavior may exercise some influence as well also as a country's infrastructure, as in the case of internet broadband distribution.

Kuikka and Akkinen (2011) have divided social media adoption barriers into two broad categories: internal challenges, involving the management challenges within the company, and external challenges, which are normally associated with company image, brand or external relations. The authors identified five categories of internal challenges: resource limitations, unclear corporate ownership/responsibility for social media, authority over social media content, negative attitudes towards social media and economic challenges (costs x benefits of social media). The authors also identified three external challenge categories: company's reputation management, potential legal issues and public versus private use of social media. Kuikka & Akkinen (2011) acknowledge that the frontiers between these categories are not clearly defined and that some overlaps exist between them.

For Sinclaire & Vogus (2011), studying fast growing American companies, the main factor for companies' adoption of social media was the mass adoption of social media by consumers. Other factors also considered by companies' executives were: ease of implementation and increased ability to communicate with customers.

Michaelidou, Siamagka, and Christodoulides (2011) researched the adoption of social media in the context of SMEs companies in the B2B space. The author identified five key barriers: lack of relevance of SNS within the industry the company operates (a major challenge in this study, but which may be highly specific to B2B companies), uncertainty of benefits resulting from using SNS, the personnel's unfamiliarity with and lack of technical skills, the great investment necessary in terms of time, and competitors' not using SNS.

In the only study conducted in Latin America (Brazil), Serra, Storopoli, Pinto, and Serra (2013) discovered that companies' adoption of social media is facilitated by its ease of access and the possibility of using it advantageously in selling and as a client relationship channel. On the other hand, the barriers were lack of qualified work force, lack of specific knowledge of social media and the challenge of attracting customers to interact with the company through the social media channel.

Wamba and Carter (2014) researched both organizational and individual factors that could drive social media adoption by SMEs. Their results indicated that manager's age, size of firm, innovativeness, and industrial sector had a positive relation to adoption.

In brief, the existing literature presents various points of view as regards adoption factors and the supporting theories employed to explain the adoption of social media.

Technology Adoption Theories

There are three distinct approaches to research into the adoption of innovations: the individualist, structuralist, and interactive processes (Kautz & Nielsen, 2004). The individualist and structuralist approaches take individual actors and organizations as their units of research. As regards the first two approaches, past research has focused mainly on variables related to the individual or to organizations, such as individual characteristics and size of organization (Sarosa, 2012). The present research will also adopt an individualist and structuralist approach.

In order to investigate social media adoption by large companies, the present research focuses on TAM. Our academic approach, following Siamagka et al. (2015), aims to adopt a theoretical framework in which constructs are more responsive to empirical operationalization (e.g. TAM) than is the case with alternative theories such as that of Rogers (1995).

In order to investigate social media adoption by large companies, the present research focuses on TAM. Our academic approach, following Siamagka et al. (2015), aims to adopt a theoretical framework in which constructs are more responsive to empirical operationalization (e.g. TAM) than is the case with alternative theories such as that of Rogers (1995).

TAM was proposed by Davis in 1986 (Davis, 1989) to explain and predict users' adoption/acceptance or rejection of new technologies. TAM is conceptually based on the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980) which postulates two behavioral beliefs, perceived usefulness (PU) and perceived ease of use (PEOU), as fundamental determinants of attitude towards behavioral intentions and actual usage behavior (AB). Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance". Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989).

In TAM, behavioral intention to use leads to actual IT usage behavior. TAM proposes that the personal attitudes towards the technology influence the adoption and use of that technology. Therefore, TAM's belief–attitude–intention–behavior connection predicts user acceptance of new technologies (Lederer, Maupin, Sena, & Zhuang, 2000).

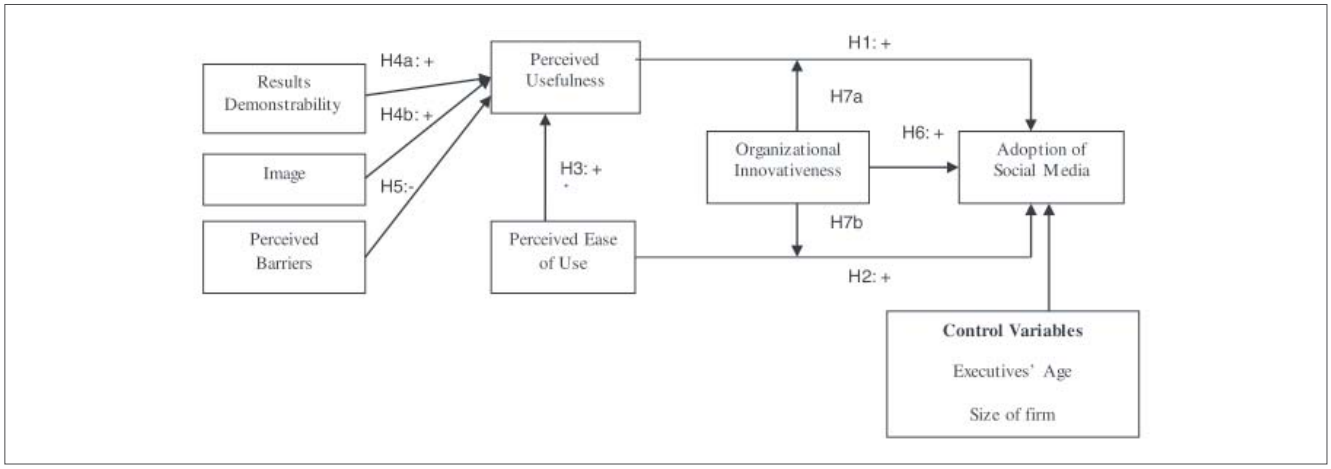
Because of its universal applicability and due mostly to its parsimony, TAM has become the most popular model and has been globally used in a diverse set of technology adoption studies (Al-Ghaith, 2015) the Technology Acceptance Model (TAM. However, when compared to the extensive individual-level TAM literature, business-level research that uses TAM is relatively rare. Having said which, there are few organizational-level technology adoption studies (Siamagka et al., 2015; Zain, Rose, Abdullah, & Masrom, 2005)the Technology Acceptance Model (TAM. For Yu and Tao (2009) there is still a gap in the knowledge and understanding of the adoption of technology at company level.

Different research using TAM has evidenced that perceived usefulness has constantly been a strong predictor of usage intention. Thus, considering the importance of this construct, a better understanding of its determinant factors would allow the development of organizational interventions that would enhance user adoption of new systems (Venkatesh & Davis, 2000).

For Lee, Kozar and Larsen (2003) even though TAM has been a robust model, it is relevant to incorporate more variables and to explore boundary conditions. For those authors, a greater understanding of factors contributing to ease of use and usefulness is needed. A specific area at present under study is examining different information systems and environments.

Different researchers have used TAM to study companies' web-related adoption of technologies such as e-mail and word processing (Lederer et al., 2000). Siamagka et al. (2015) have used TAM to explain companies' adoption of social media. The authors identified factors that determine adoption and their results indicate that PU of social media, within B2B companies, is determined by image, perceived ease of use and perceived barriers (Figure 1). Furthermore, they found evidence that organizational innovativeness and PU significantly affect the adoption of social media.

Figure 1: Social Media Adoption Model



Source: Siamagka et al., (2015)

Methodology

This study is qualitative and exploratory in nature and seeks to create a new and enhanced understanding of an emerging and complex phenomenon (i.e. the adoption of social media by companies). This research has adopted a realist approach.

The data presented comes from the participants' experience in adopting social media networks for their businesses. The method chosen for collecting these data is the semi-structured interview (Creswell & Creswell, 2017). The qualitative approach with one-to-one semi-structured interviews permits the exploration in depth of all the facets and perceptions of marketing executives within the social media adoption process (Nah & Saxton, 2012)capacity, governance and environment. Using Twitter, Facebook, and other data on 100 large US nonprofit organizations, the model is employed to examine the determinants of three key facets of social media utilization: (1.

The interviewees were not selected randomly. They were chosen deliberately since they were in a position to provide relevant insights into the understanding of the use and adoption of social media. The executives had an intermediate or senior managerial position within the marketing function (or in overseeing marketing, for instance, a Vice President of sales and marketing) and worked for large corporations.

The starting point for gathering research participants came from the researchers' professional network and, as it is a conceptually driven sampling, new informants were included as information

called for exploration from a different perspective, so new managers were invited to take part in the research. The research development process has a constant reciprocal flow between data collection and analysis, leading to concepts and back to data collection in a permanent cycle that only ends when there is saturation (Corbin & Anselm, 2014).

A total of seventeen marketing executives from different industries were interviewed during 2015 and 2016. The interviews took place in the interviewee's company's office (except for one that was undertaken by Skype call) and lasted, on average, 47 minutes. The interview guide was composed of questions based on: (i) existing literature on the adoption of social media and organizational decisions for the adoption of innovative technologies, and (ii) the field experience of the authors. Each interview was audiotaped and recorded with the explicit permission of the interviewee. Interviews were transcribed verbatim, and the software Atlas.TI, version 7.5 for qualitative analysis, was used to perform the analysis. Data were hand-coded paragraph-by-paragraph.

The data set was analyzed using thematic analysis. Thematic analysis includes the identification in a data set – be that a number of interviews or focus groups, or a range of texts – of repeated patterns of meaning (Braun & Clarke, 2006). The development of themes and codes was undertaken using a "theoretical" thematic analysis approach. According to Braun and Clarke (2006), this approach is directed by the researcher's theoretical or analytical interest in the topic and is, therefore, more explicitly analyst-driven.

With this approach, the codes were initially developed based on the existing literature and researcher's own field experience. As the research progressed, transcripts were read several times to identify the key themes and categories. This constant revision led to both mapping of recurring patterns of social media adoption and also of new codes.

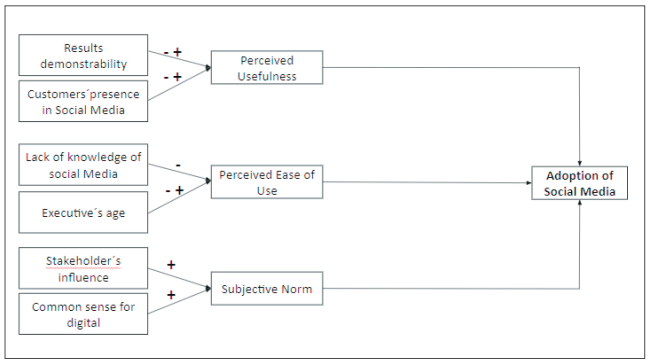
From the content analysis, different factors and relations emerged. These factors were confronted with the existing literature on social media adoption and of TAM. These comparisons made it possible to identify factors and relations that had not previously been considered in the literature and to corroborate some factors and relations already identified, thus expanding knowledge of the phenomenon.

The two researchers, who reviewed the transcripts independently, established inter-coder reliability. Divergencies in the coding were resolved by discussion.

Results

A theoretical model for social media adoption was proposed (Figure 2) based on the literature and the field research results. The research model should not be over-complex, allowing a solid research base for future firm-level TAM studies, but at the same time should not be overly simple in its scope avoiding critical reviews of TAM-related studies (Bagozzi, 2007; Yu & Tao, 2009).

Figure 2: Proposed model of social media adoption



Source: the authors

The most common point present in all the interviews is related to social media results, which was defined as "Results Demonstrability" in the proposed model. According to Venkatesh and Davis (2000), results demonstrability is related to the extent to which the results of using a certain technology are visible within a company and also relates to the challenges employees face in communicating the results to other corporate stakeholders. For these present authors, systems may not be adopted despite being effective, if users have difficulty in relating job performance to the adoption of the system.

TAM proposes that results demonstrability has a positive influence on perceived usefulness. Thus, it is to be expected that users should have a better PU if the relation between system usage and positive results are clearly visible (Venkatesh & Davis, 2000).

For a certain group of the interviewees, there is great uncertainty about return on investment and there are challenges associated with demonstrating the results obtained in social media marketing. This is in line with Jobs & Gilfoil (2014), for whom lack of financial return is the main reason companies make but little investment in social media. From the executives' point of view:

> *"We pay to advertise, to get more clicks and likes. But at the end of the day, I am always left with that doubt: how much will those likes revert to sales?"* Beauty and cosmetics industry executive

> *"I am making a great effort for us to use all the social media performance tools focused on CRM, in client acquisition, but so far we have performed poorly in all the tests."* Retail industry Executive

> *"I think that commercially [social media] has not proven itself. There are a lot of cool things in digital communication, but when you look at the financial results of the big ecommerce players, you see a negative [cash flow]"* Retail industry Executive

This is probably due to the facts that social media channels are very recent and that they are more, for most industries, a relationship channel than a direct sales channel. For Weinberg, Pehlivan, & Street (2011) management has a strong need for "proof" of return on marketing investment (ROI) and an apparent uncertainty about the return on social media.
On the other hand, there is a group of executives that strongly believe

in social media results and the ease of demonstrating results. From their point of view:

> *"What I find very interesting in the online world is that everything is measurable. The banners that we bought, the media we purchased, all the adds that we bought in Adwords, everything that was done on Facebook, which posts were more engaging… At the most [regarding TV] you would raise questions as to why to invest or not to invest in a certain TV show. But you cannot measure the return in the way that you measure the online."* Retail industry Executive

> *"Int: do you believe that social media marketing produces results for your business?*
>
> *Exec. Certainly! Many!*
>
> *Int: How do you see these results?*
>
> *Exec: When you post something and people are discussing it, you get to know who the person who is buying and is eager to know and buy more is. So it is much quicker to measure things using social media than any other form of stakeholders' communication."* Finance industry Executive

So considering the two groups found we propose that results demonstrability have a direct impact, positive or negative, on social media PU.

The presence - or otherwise - of a company's customers on social media platforms was a factor frequently mentioned in the interviews. Sometimes it was mentioned as a determining factor in investment and at others it was mentioned as a barrier to investment. From the interviews:

> *"Every year we are increasing a bit [social media investment]. And this is related to the fact that our target audience in several products, especially on fiber broadband, is daily more present in the digital world than in the offline/TV world"* Telecom industry Executive

> *"Product A or even Product B can be a product for younger people and can be a category that needs a larger investment in social media. If I want to talk to a younger generation, they are more present in the social media."* Food industry Executive

These points of view lead to the following proposition: the degree of the customer's presence on the social media has an impact on the perceived usefulness of the social media.

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The knowledge of the social media was also a preeminent topic in the interviews. This is consistent with previous literature that identified managerial knowledge as a key factor in adopting new technologies. Aguila-Obra & Padilla-Meléndez (2006) identified managerial capabilities, together with technological resources, as the main organizational factors that explain Companies' adoption of internet technology tools. Kiron, Palmer, Phillips, & Kruschwitz (2012) found evidence that the main barrier to adoption of social media is a lack of management understanding and knowledge of social media marketing. For Kietzmann et al. (2011), despite social media's importance, many executives eschew or ignore this form of media because they don't understand what it is, the various forms it can take, or how to engage with it and learn. Serra et al. (2013) and Kuikka and Akkinen (2011) also identified this barrier.

Additionally, it seemed that younger executives more accustomed to social media were more inclined to invest in and deploy social media. This is probably related to a better understanding and knowledge of it.

> *"Exec: I think they [the board] still don't understand [social media] … they are at that level where talking about digital marketing means to have a website with all the company's information.*
>
> *Inter: And this lack of knowledge could influence investments levels?*
>
> *Exec: I think so... I think that because when you speak at board level, within this decision-making process of investment allocation, they have an active role."* Food industry Executive

> *"This online world… I am 42 years old and I have the impression that I am super old and outdated".* Telecom industry Executive

> *"On my part, there is a large gap in the understanding of social media. I feel that I don´t fully understand its metrics and that it is always changing".* Beauty and cosmetics industry executive

Thus, this leads to two propositions: (i) the lack of knowledge of social media impacts the perceived ease of use of social media negatively; (ii) the executive´s age can affect the adoption of social media.

Furthermore, an interesting relation between lack of knowledge and the influence of marketing agencies emerged from the interviews. It seems that executives readily acknowledge their lack of knowledge (for themselves and their teams) and rely heavily on external advice from specialists. This finding is corroborated by other studies that have recognized the influence of external expert advice on the companies' adoption process (Aguila-Obra & Padilla-Meléndez, 2006).

> *"So, social media was something new to me. It was Agency X which gave me confidence as to how to make investments and how to act on Facebook and other media as well. Practically the strategy came from the agency ready for us to approve."* Retail industry Executive

> *"I say that we are still learning [social media marketing]. I don't think that I know anything; I still need to learn a lot to be able to use this tool correctly and assertively. We are still greatly influenced by those who understand it. For instance, the agency that works with us."* FMGC industry Executive

Besides the specialists, other stakeholders appeared to exercise influence on the decision-making process. They are mainly represented by the younger people in the executive's team. For instance:

> *"I have X [a mid-level analyst] on my team. He is an expert, a guru. He is the one who really defines the digital strategy."* Finance industry Executive

Some executives argue that they believe in the channel, but other stakeholders in the company are not aligned with this vision.

> *"When we present a campaign in digital marketing normally the board says that it is just a complement. An investment in social media will not generate a quick sales result. It will not generate consumption in the retail chain the next morning. We still have this vision at board level"*. Food industry executive

> Int: "So what prevents you from doubling your investment level in social media?"

> *Exec: "It is the short-term view. Truly. For you to invest in social media, in building your brand, your perspective has to be longer-term than the quarter. At the end of the day, it boils down to your CEO's agenda."* Telecom industry Executive

Previous research has evidenced that organizational decision-making behavior is not only influenced by the rational and irrational components of individual decisions, but is also influenced by the multidimensional stakeholders (Nelson & Quick, 2006). Yu & Tao (2009) also corroborate the influence of the Social Norms as a strong influencer of the adoption of business-level technology.

Considering the literature and the evidence provided by the interviews, we propose that: Stakeholders´ influence has a positive impact on the Subjective Norm.

In the interviews, a common point of view that digital and social media marketing are the future way ahead was frequently mentioned. Interviewees, to different degrees, seemed confident that there is no going back on investing in digital marketing and that their industry or the market as a whole was moving in that direction. From the interviewees' point of view:

"Everybody is saying that digital media is growing, that it is very important, that it is growing and that it is a much more direct means of conversation with consumers" FMGC industry executive

"Why is it [investment in social media marketing] not zero? There is common agreement that zero investment is wrong because the world is changing in this direction. It is, therefore, something we should invest in." Telecom industry executive

"Because we so often hear that this [social media marketing] is the way ahead and by seeing the example of big companies… we end up saying 'ok'." FMGC industry executive.

In view of the literature and the evidence presented in the interviews, we propose that: a Common sense for digital media influences the Subjective Norm positively.

Conclusions

There is limited research on the adoption of social media at the company level. In this sense, this research contributes to existing theory by building on previous work on models of the adoption of social media. The proposed model of adoption corroborates some of the findings of Siamagka et al. (2015) and, at the same time, proposes that other variables also influence adoption. Specifically, we identified a variable (common sense for digital) that has not been acknowledged previously in the literature.

From a managerial point of view, this research is relevant for large companies' executives, social media platforms, and agencies as it presents perspectives and insights on levers favorable to social media and barriers to it that marketing executives have. Each stakeholder may use this information to minimize barriers to adoption and to foster levers. For instance, the training and presentation of success stories may be very useful for executives that shy away from social media marketing.

There are limitations to this study. First of all, our results are based on a small sample of interviews, thus they cannot be extrapolated to apply to all companies in the process of adopting and using social media. The interviewees were also handpicked from the researcher's professional network and may thus be biased.

This research can be extended with a quantitative phase to further explore the propositions and relations identified. Other potentially interesting research topics include the evaluation of barriers to adoption in another group of organizations such as the SME business.

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Try Before You Buy: How to Design Information Systems to Enhance Consumer Willingness to Test Sustainable Innovations

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Abstract: More and more business organizations recognize the relevance of sustainable innovations as driving factor for their corporate strategies, products and processes. But while the concept of sustainability is generally ratified by employees and consumers, their willingness to actually use or buy such innovations can be low. One of the most important facilitators for the adoption of innovations is self-experience generated by testing the innovation. This paper provides insight on how sustainable innovation testing affects consumer mindsets and which barriers consumers face when considering testing a sustainable innovation. The study draws on the data from an in-depth interview study with seven providers and consumers of electric cars (as sustainable innovation) in business and private environments. Insights about the nature of consumer's willingness to test are extracted and recommendations for the design and use of information systems as facilitators for testing sustainable innovations are derived.

Keywords: sustainable innovation; e-car, interview study; barriers; trial; decision design

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Introduction

In today's corporate business strategies sustainability plays a central role as consumers are becoming increasingly aware of the environmental consequences of their purchases (Fraj & Martinez, 2007). Corporations respond to this development by increasing the share of sustainable products and services in their portfolios, by adjusting internal processes to sustainability guidelines or by enhancing the sustainability of the whole supply chain (Melville, 2010). In general, the concept of sustainability is widely accepted and supported by providers and consumers. However, in contrast to this acceptance it can be observed that consumers or employees resist to purchase or use sustainable innovations (Pichert & Katsikopolous, 2008). Such a resistance, however, is only partially related to the innovation itself. Even if consumers are open to environmental topics, it is not ensured that they also will adopt sustainable innovations (Ozaki, 2011). Whether a consumer behave in a sustainable way is strongly determined by their value system and personality (Kollmuss & Agyeman, 2002). Living sustainable almost always means a change from long-established habits towards new behavioral patterns (Kollmuss & Agyeman, 2002). Since consumers tend to stick to their established behaviors they are less open to new alternatives even if they have the option on superior choices (Heidenreich & Handrich, 2014; Laumer, Maier, Eckhardt, & Weitzel, 2016; Samuelson & Zeckhauser, 1988). To enhance the adoption of sustainable innovations, one has to motivate consumers to open up to behavioral change and test them. Trial strongly affects the perception of the innovation because it provides a direct sensory experience which is perceived as more trustworthy as indirect advertisements (Kempf & Smith, 1998). Furthermore, there is evidence that product trial causes feelings of attachment and partial adaptation of ownership caused by the endowment effect (Wolf, Arkes, & Muhanna, 2008). To induce behavioral change and get more consumers engaging in testing sustainable innovations, predictors and antecedents of consumer's willingness to test must be adequately addressed in information systems. Interfaces like apps, web pages or online platforms are commonly used facilitators of behavioral change (Weinmann, Schneider, & von Brocke, 2015). Thus, to enhance sustainable behavior in industry and society it is crucial to better understand how to design such information systems to promote sustainable decision-making (Melville, 2010). There is still lack of knowledge on how to design information systems to enhance consumer openness towards innovation testing and induce behavioral change (Benartzi & Lehrer, 2015).

In this study, electric cars (e-cars) are chosen as example for a sustainable innovation. Establishing e-cars in society is of governmental interest to reduce environmental pollution and ensure the fulfillment of the climate goals of the European Union (Jochem, Babrowski, & Fichtner, 2015). Until 2050, industry and society have to have reduced greenhouse gas emissions of transport by up to 60% - a reduction which is only feasible with alternative and more sustainable propulsion technologies (Abdelkafi, Makhotin, & Posselt, 2013; Stryja, Satzger, & Dorner, 2017). The problem of e-cars is their missing market acceptance, i.e. despite their environmental benefits, they are still perceived as inferior choice compared to diesel or gasoline cars (Dudenhöffer, 2013). However, research shows that once consumers have tested them, their perceptions of e-cars are favorably affected (Bühler, Cocron, Neumann, Franke, & Krems, 2014). This study addresses the lack of knowledge on how information system design may influence decision-making in terms of sustainability. It aims to answer the questions of (1) how innovation (e-car) testing affects consumer mindset, (2) what hinders consumers from testing e-cars and (3) which information system design options may enhance consumer motivation to test them.

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Methodology

The data reported in this paper has been collected within seven in-depth interviews conducted with providers and consumers of e-cars to consider the perspectives of both interest groups. For the provider side four representatives from business organizations that sell e-cars as part of their sustainable product portfolio or use them in their corporate car fleet as contribution to the organizational sustainability strategy were asked. As for the consumer side three private users were interviewed to gain insight about topics relevant in the private context of e-car testing. Participants were sampled by following two criteria: role and experience. As providers, they must be in a position where they have a promoter role for e-cars in their organization, i.e. trying to enhance their usage or sales numbers. As consumers, they must be in a position where purchase or usage of e-cars are a realistic scenario for them, i.e. being capable to afford a car and being in a situation where the use of a car makes sense in case of work and private life. Participants of both groups should have experience with e-cars to ensure a certain depth of content in their responses. For providers, a minimum experience in their position of 2 years were determined while consumers should have experienced at least one detailed test drive (more than 30 min.) to be able to speak about the topic. Participant's profiles are provided in Table 1.

Table 1. Participant's profiles

Participant	Age	Participant Group	Profession	Experience with e-cars
1	n/a	Provider	Marketing and Sales Representative	5 years
2	n/a	Provider	Sales Manager	3 years
3	n/a	Provider	Consultant	7 years
4	n/a	Provider	Fleet Manager	6 years
5	28	Consumer	Researcher	Test of e-cars (3x)
6	28	Consumer	Software Engineer	Regular use of e-cars in carsharing (8-10x/month)
7	35	Consumer	Consultant	Test of e-car (1x)

All interviews followed a semi-structured guideline with several question blocks. Open questions were used to give the interview partner the possibility to share as much expertise as possible. As provider and consumer have different views on the same topic questions in the interview guideline were adapted to both groups with the result of having two similar but slightly different question sets. Providers were asked about the e-car test process in their organization, the willingness to test among their employees and customers and their barriers. The current use of information systems and potential ideas for a more effective use regarding testing motivation were discussed resulting in a set of 22 questions. Consumers were asked about their test experience, the willingness to test among their private environment and testing barriers. In addition, recommendations for the design of test drives and the use of information systems to facilitate them were discussed resulting in a set of 19 questions. Each interview lasted between 30 min (shortest duration) and 90 min (longest duration) and was conducted in a face-to-face conversation held by one interviewer. Six interviews were recorded and transcribed afterwards. One participant disagreed to the interview recording. For this interview notes were taken during the conversation.

The analysis of the interviews followed the qualitative content analysis of Mayring (1991) in which essential statements in the material are extracted subsequently. The extraction process is based on an iterative process of paraphrasing, reducing and aggregating statements relevant to the research question. In doing so statements are generalized repeatedly to achieve a higher level of abstraction necessary for subsequent analyses (Mayring, 1991). In this study, full transcripts were available for six interviews, three relating to electric car providers and three relating to electric car consumers. For one interview with a provider conversation notes were used for the analysis. Participant statements were first grouped according to the question they belong to before then being paraphrased resulting in a set of 227 statements from providers and 136 statements from consumers. In a second step the statements were coded according to the two-cycle recommendations of Saldana (2009). Data was first descriptive-coded by summarizing the basic topic of a statement in a word or short phrase (Miles & Huberman, 1994; Saldaña, 2009). Common statements were selected and used as first set of coding categories which were then pattern-coded in the second cycle to identify major themes in the data (Miles & Huberman, 1994; Saldaña, 2009). Both groups, providers and consumers, were analyzed separately due to the different set of questions. Results on the same topic (e.g. willingness to test or barriers) were extracted separately and merged for the presentation in the paper. To clarify the resilience of the data, three levels of evidence were used to classify the quality of each major topic. The level of evidence of a major topic calculates as mean value of the cumulative share of the topic's appearance in all provider and consumer statements. Depending on the mean value, the level of evidence is "strong" (mean value > 25%), "moderate" (mean value >= 12.5 %) and "low" (mean value <12.5 %).

Results

In this section key results of the data analysis are presented and discussed. Results will not be distinguished into provider and consumer statement if the statement has a general nature. A summary of key topics, whether they appeared in provider and/or consumer statements and their strength of evidence are provided in Table 2. In the following sections the findings and the evidence for them are discussed in more detail. Direct quotes in the text are verbatim.

Current consumer willingness to test e-cars

The interview participants were asked about the willingness of their customers, employees or private environment (family, friends and colleagues). In general, all three groups are generally open towards the technology but have a low willingness to test. Employees and customers from the e-car providers seem to be more willing to test than the private environment of the consumers. Interest and curiosity to drive an innovative car play an important role for the willingness to test. Also important is whether the e-car will be usable for the employees later. Almost all providers emphasize that most of their employees and customers would test if they would have the opportunity. Those who show a strong resistance towards testing only form a small group. However, test convenience is important as especially consumers who already own a car do not come in touch with e-cars in everyday life. Test drives would only be used if they would be "*handed to them on a silver platter" (consumer statement).* Incentives like test voucher or increasing the presence in media might also help to enhance visibility. Especially in the context of car sharing the willingness to test is surprisingly low.

Table 2. Summary of key findings and supporting evidence

	Theme	Major Topic	Provider statement	Consumer statement	Strength of evidence
1	Consumer willingness to test e-cars	Openness towards technology but low willingness to test	x	x	Strong
		Willing to test because of future relevance	x	x	Moderate
		Willing to test if convenient	x	x	Moderate
		Willing to test if incentives are provided	x	x	Moderate
		Willing to test if e-cars are on the spot in media		x	Low
		Willingness depends on age bands	x	x	Low
		Low willingness due to missing touching points with e-cars in daily life		x	Low
		High willingness due to technological affinity		x	Low
2	Effect of testing on changing consumer mindsets	Removal of doubts about technological functionalities	x	x	Strong
		Illustration of technological benefits arouses enthusiasm	x	x	Strong
		Raise of general consumer awareness for e-cars		x	Low
		Realization of e-cars as forward-looking mobility technology		x	Low
		Comparison with features of own car		x	Low
		Creation of trust in technology		x	Low
		Encouragement of reflection about own driving behavior	x		Low
3	Barriers that prevent e-car testing	Maturity level of battery and infrastructure too low to match consumer requirements	x	x	Strong
		Operation of e-cars not economically manageable	x	x	Moderate
		General refusal of e-car technology	x	x	Moderate
		Features of e-car are perceived as minor than those of car currently owned	x	x	Low
		Fear of not being able to handle challenges of e-car driving	x	x	Low
4	Recommendations for the design and use of IS to motivate e-car testing	Make booking process and test event as convenient as possible	x	x	Strong
		Place e-cars at prominent positions (e.g. landing page)	x	x	Strong
		Highlight e-cars with symbols or slogans (e.g. green leaf)		x	Moderate
		Incentivize with vouchers or discounts	x	x	Low
		Call on good conscience (e.g. slogans)		x	Low
		Use of testimonials who already tested e-cars or reports from friends on social media		x	Low
		Proposal of e-car if application case is predestined for e-cars (e.g. rental e-car for one-way trip)		x	Low

Here, younger customers are the group which book such cars more often while older members tend to be more hesitant. Technology affinity also plays a role for openness. Consumer participants reported that friends with a higher interest in technology are more open to try out e-cars. In total, there is evidence that consumers are in general open towards the technology but with a low willingness to take the effort to test it. Testing should therefore be made as convenient as possible and to be integrated in every day life such that consumers with no awareness can get in touch with e-cars easily.

The effect of e-car testing on changing consumer mindsets

Self-experience is one of the key elements for the formation of an individual's opinion. Only by making the experience of touching and using the innovation one is able to comprehensively evaluate its individual usefulness. General effects of testing and effect causes have already been discussed in section 2. This section elaborates how specifically testing of e-cars changes consumer mindsets and usage behavior. All interview partners explicitly mentioned that their e-car test drives (or those of their customers) had removed doubts about the technological functionality. Concerns regarding complexity and effort of charging were identified as being less powerful than imagined. In most cases the perception of the technology was very positive. Driving the e-car was perceived as being much easier and more convenient than driving conventional cars (e.g. 17-inch touch display in the dashboard, no gearbox). Consumers state the problem of teething troubles which prevents them from e-car purchase. As long as the problems of low battery range and weak charging infrastructure are not solved and no standards exist investing in e-cars is perceived as too risky. To remove functionality doubts it is important that consumers can test the e-car for enough time and in application cases similar to their daily use behavior. The approach of Tesla to provide a consultant during the test drive has been experienced as very useful as questions could have been answered instantly. Also, additional information on potential costs and benefits was provided to the consumer which the person did not consider beforehand (e.g. maintenance costs, battery warranty). The issue of heavy batteries and related acceleration problems could also be disproved. In total, simplicity of concepts – be it in the car or in the organization of the test drive – convinces consumers. The easier it is to test the more positive the opinion of the technology. Besides removing doubts about the functionality testing has the powerful effect of visualizing and illustrating the benefits of an innovation. In case of e-cars consumers were fascinated from the quietness in the car (especially useful for business calls) and the instant acceleration when pushing the gas pedal. The car was so silent that some consumers did not even noticed it has started when pushing the ignition button or using the ignition key. Emotions before the test drive are described by the consumer participants as "looking forward" and "being curious" and after the test drive as "positive" and "good". Several participants mentioned that they had the feeling of anticipating the future while driving the e-car. Testing convinced them that e-cars will be the car technology of the future. Driving comfort, innovation factor, handling simplicity, acceleration and the feeling of doing a good action to the environment are factors that cause enthusiasm. One participant explicitly states: "*Without testing the e-car I would still be interested but I would not be that fascinated I am now*." Both effects, removing doubts and creating enthusiasm by illustrating the benefits, have been stated repeatedly in both participant groups while other effects appeared less in the data. Nevertheless, they offer interesting perspectives on the topic and have thus been included in the paper. As mentioned in an earlier section raising consumer's awareness for the innovation and overcoming the "convenience barrier" is the critical point for providers. Presenting e-cars at mass events or as rewards for loyal customers are some of the activities which may help. The consumer with one test experience explicitly states that testing the e-car has raised general awareness of the topic in media and daily life significantly. Because the display of the driving range gives instant feedback on driving behavior (e.g. a strong decrease in range when pushing the gas pedal too powerful) drivers are encouraged to critically reflect their driving behavior. The realization that e-cars have the capability to be the leading mobility technology of the future is another observed effect. It can be said that testing creates trust in the technology where there has been doubt beforehand.

Barriers that prevent consumers from e-car testing

During the analysis of the interview data it got more and more obvious that the interview participants had difficulties to name barriers which prevents consumers actually from testing and not from the technology itself. Barriers stated in the direct responses of the interview partners to the question mainly comprise barriers towards the technology itself. However, it is important to emphasize that practical barriers like missing convenience, missing awareness of the technology etc. can be barriers to testing, too. As they have only be stated indirectly in the responses to other questions, those factors are not presented in this section but are considered in the recommendations section later. The barriers explicitly stated in the interview responses are summarized in the following section. It is no surprise that most providers and consumer participants state technological immaturity as main barrier. Skepticism regarding driving range, charging times and availability of charging stations in public are factors that prevent consumers from getting in touch with e-cars. Most people are not used to the impact their driving behavior has on their driving range as it is the case with e-cars. Some consumers state this impact as limiting factor for their enthusiasm for the technology in general. Depending on the e-car model, a driving range actually can be a limiting factor. In the context of car sharing e-cars are not booked due to the fear of customers to find the battery only half loaded when they arrive at the car because the user before just returned the car. To address the fear the car sharing company offers a free change to another car if the battery is insufficiently loaded. As side effect of such concerns, operating e-cars - for providers as well as consumers – is considered as not being economically manageable. High investment costs in car and charging infrastructure deters consumers from adopting the technology. Furthermore, due to the low oil price and limited driving range, e-cars are not considered as economically reasonable alternative to conventional cars. Especially in the case of e-cars as corporate cars investment costs play an important role as they have to be paid partly by the employee through a monthly fee. As in corporate

car contracts cover gas and maintenance costs are usually covered by the employer there is the problem that by choosing an e-car the employee anticipates higher investment costs but does not profit from lower operating costs. E-cars are perceived as inferior choices. Besides functional issues a general refusal of the technology can be observed, too. Interview participants of both groups state that there is no willingness to behavior change in case of charging or driving manner. Effort for charging is perceived as being too high and even the use of Tesla superchargers is refused due to being too complex. Observing the influence of individual driving manner on the driving range is perceived as being restrictive and a fun killer. Resistant consumers who close their mind to the technology do not appreciate the necessity of testing due to the assumption that e-cars in general will not work for them. While closed-mindedness is a barrier relatively difficult to overcome for providers, the last two barriers observed in the data offer more possibilities for interaction and conviction. Especially consumers who own a car are instantly comparing the features of the e-car with those of their car currently owned. Missing engine noise, different power levels of e-cars compared with high investment costs induce a feeling of inferiority of the e-car. It is important to encourage those testers to rethink their approach towards driving in general. An interesting barrier mentioned by both participant groups is the fear of not being capable to manage the charging and driving process. One consumer participant explicitly states that the personal environment perceives themselves as well as the technology as not being mature enough for adoption.

Recommendations for the design and use of information systems to motivate e-car testing

The factor which influences a consumer's decision to make a test drive by far the most is the perceived convenience. Especially when there is no hype on the innovation which encourages consumers automatically, convenient test drives are important means for adoption probability. E-cars itself do not motivate for more effort. Making the booking and test process as easy and convenient as possible has thus been emphasized by all participants and with strong evidence. Test opportunities should be provided at places that are easy to reach. For example, in car sharing, consumers are not willing to walk an extra mile to drive an e-car. Test drives should be for free and without obligations (e.g. not being charged for refilling the battery after driving) for the consumer. Consumers should not have the feeling of being actively persuaded to do something they are not willing to do. The booking process should be as pleasant and simple as possible (e.g. by using a large, simple booking button). The visit in the car dealership can therefor already be a barrier itself (e.g. the perception of having to adhere to a certain dress code): *"This is like a wall and a completely different experience as compared to the landing page I was navigated to by a simple Google search."* Placing the e-car on a prominent position on the website's landing page or in the booking system is a simple yet powerful tool to enhance consumer awareness. Just by being aware of e-cars more consumers will consider them in their decision-making process. Prominent placement has the effect that e-cars are perceived as being something special and worth to be considered as serious alternative to conventional cars. Provider and consumer participants repeatedly emphasized the large potential of such promotions. Placing e-cars at the top position in car sharing or rental car booking platforms will induce a higher willingness to click on those models (like the first search page or Google or the partner hotels in booking.com). As one consumer states: *"I believe there is a huge potential regarding positioning and presentation of e-cars in booking scenarios."* One consumer participants described how s/he made the impressive experience of a taxi drive with a Tesla and afterwards saved this taxi driver as favorite in the taxi booking app to accelerate future bookings. Especially in the business context rental cars are often booked by using a consumer hotline. Here, providers can propose e-cars. Besides convenience and prominent placing, using symbols or other visualizations enhances visibility and consumer motivation to consider e-cars. Being announced as "novelty" or marked with a symbol for ecological friendliness (e.g. tree or green leaf) is proposed as promising means by consumer participants. Using conventional marketing tools like incentives or vouchers might enhance motivation further (see also section "Test scenarios". An interesting topic which occurred in the consumer participant data was the effect of calling on the good conscience of the consumer. As example, one car sharing company is named which builds on this mechanism by providing a small leaf in the car dashboard. Depending on the driving behavior, the leaf changes from green to red. A similar mechanism could be implemented as feedback when booking a conventional car sharing or rental car with a high carbon dioxide emission. Using slogans that promote eco-friendly choice behavior in an appealing manner might be another way. Since experiences from friends and colleagues are an important motivation factor, using testimonials who actively use e-cars or at least have tested them can be useful to enhance credibility in the innovation. The psychological factor of observing the functionality of the technology is important. Using test reports on websites or integrate experiences shared in social media in booking platforms may further options to consider for providers. Especially car rental companies often face the challenge that consumers need the car only one-way. For this inquiries e-cars could be actively proposed by the booking system by selecting them as the most appropriate and eco-friendly car.

Discussion

To understand the reasons that drive consumers to (not) test a sustainable innovation like e-cars and how information systems can be used to enhance the willingness for innovation testing has been the thrust of the analysis. The study contributes by giving a comprehensive view on the question how information systems can be used to support the adoption of sustainable innovations. Although the study has been conducted in the context of e-cars its findings offer interesting insights that may also be valid for innovations with similar characteristics and problems. By conducting interviews with representatives from the provider and consumer side, a deeper understanding of both perspectives was possible. Furthermore, providers were selected according to the premise to cover all possible ways of e-car adoption: purchase (car dealer), usage in car sharing (car sharing provider), usage in business fleet (retailer) and corporate car (consultancy).

The study contributes to previous work by elaborating barriers and effects of testing for a sustainable innovation at the case of e-cars. Since the character of the study was an exploratory one it never has been the goal to present statistically validated constructs at the end. In contrast, the thrust of the research undertaken was to illustrate the nature of the phenomenon that innovations which are accepted and approved by consumers as being forward-looking technologies face such difficulties to attract consumers to test and adopt them. This attitude-behavior gap can be observed in many cases but especially in the case of pro-environmental behavior (Kollmuss & Agyeman, 2002). The results of the study allow a clearer understanding of the factors behind this gap in case of e-cars. It was interesting to observe the relevance of convenience for consumer willingness to test. To close this behavior-attitude gap using information systems is the premise of this work. Thus, important design elements that facilitate e-car testing (as one form of pro-environmental behavior) were collected in the conversations and elaborated in the interview analysis. The recommendations presented in this paper provide clear and simple insights which can be useful stepping stones for practitioners and scholars. Marketing managers can use them as concrete instructions for the design of their website or booking systems. By being aware of test barriers, the promotion of test offerings can be designed to by-pass those factors. Currently, the potential of information systems as means to promote e-car testing is rudimentary exploited by e-car providers. The application of the design guidelines proposed in the paper offers a high potential of attracting more consumers to testing - and potentially adopting - e-cars. Further research on the effect of their application on consumer choice behavior might generate further interesting insights on the topic.

This research has some limitations, though. First, the small sample of seven interviews is not representative and thus allows a limited generalization of the findings. While the small number of interviews allowed an in-depth analysis of the statements, it would be necessary to state the questions to a larger sample to verify the statements made. Second, participants of the consumer sample show a slightly pro-technology bias due to their age, profession and attitude. It would be necessary to include also elderly consumers in the sample to gain a more realistic view on the motives behind their choices. Third, all consumers have made test experiences with the models of Tesla which use their own well established charging infrastructure. Experiences gained in such test drives are not representative for other e-car models. However, Tesla shows how the e-car technology should (and one day will) be working and is currently maybe the only way to experience the real potential of an e-car as problems not relating to the technology itself (e.g. missing infrastructure) are already solved. But despite these limitations, insights from this study may serve as valuable starting points for further research or as inspiration for practitioners to consider the relevance of innovation presentation in information systems.

Conclusion

While sustainable innovations like e-cars are mentally accepted by consumers their adoption rate is still on a low level. Consumers who are open to environmental topics are not automatically those who also adopt such a sustainable innovation. Rational reasons like an insufficient technological maturity or the uneconomic operation of e-cars may be one explanation for such consumer behavior. The goal of this study however was to dig deeper to identify hidden factors that prevent consumers from even considering the test of e-cars while being generally open to their use. As testing a new product comes in general without any obligations there is the question why so few consumers are willing to test e-cars. Results from this study provide answers to this question. By conducting seven in-depth interviews with providers and consumers of e-cars, it was possible to gain insight from both perspectives on the problem. Results show that test events should be as convenient and playful as possible, ideally embedded in cooperations with other organizations like restaurants or provider of adventure trips. The greatest effects of testing lie in removing doubts on functionality and create an emotional bond to the e-car by arousing enthusiasm. The study also shows why so few consumers are actually testing e-cars. Missing convenience and incentives, low presence in media, missing touching points in everyday life and possible restraint because of age are factors which occurred in the data. Some of them can be addressed by designing and using information systems appropriately. Placing e-cars at prominent places on website or in the booking system may one option. Highlighting with symbols and calling on good conscience are further possibilities for the design of information systems. The study results contribute to innovation resistance theory, theory of product trial, choice architecture and research on decision support systems. To gain more knowledge about an appropriate and effective design of information systems to influence consumer testing behavior was the scope of this study. By analyzing the current use of information systems in e-car test marketing and by giving recommendations for persuasive design and use of such systems this study provides several links for further research.

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Causation and Effectuation: An Exploratory Study of New Zealand Entrepreneurs

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Abstract: The aim of this paper is to explore the decision-making processes of causation and effectuation within New Zealand entrepreneurs. One-on-one, semi structured interviews were conducted to investigate; the extent of Causation and Effectuation followed by entrepreneurial start-ups in years four to eight of operation? In Addition, whether decision-making process and perceptions of market uncertainty differ across industries? Findings indicate that effectuation was predominantly followed. This research extrapolates new, key themes regarding decision-making. The decision-making process was largely seen as entirely subjective and dependent on the personality of the entrepreneur, their opportunity recognition experience and ideals of running the business.

Keywords: Causation; effectuation; decision-making; strategic decision-making; personality; opportunity recognition; entrepreneur

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1.- Introduction

Entrepreneurial start-ups are characterised by uncertainty. They fight to survive and with little tangible and intangible resources it can be difficult for the entrepreneur to know how to best organise the emerging venture. Not surprisingly, much literature surrounds entrepreneurial start-ups to understand their decision-making processes when responding to complexities and uncertainties of challenging environments.

Over time many theories have emerged of how decisions are made, from the normative model based on the notion that decisions follow a multi-step goal driven model/process? between alternatives that follow an orderly path, to James G. Marchs' work on challenging the dogma of pre-existing goals to argue that we make decisions under uncertainty (Augier, 2004). Another notable theory is that of Karl E. Weick, who argues that goal driven-decision making is not how decisions are made, rather we make sense of our environment and rationalise decision-making from there (Starbuck, 2014). Whilst, Mintzberg also challenges the rational model and argues how, in an entrepreneurial setting, decision making is much more difficult and there is often the need to make decisions before we have rational information (Mintzberg & Westley, 2001).

As decision-making literature shifted from the rational model, to more critical perspectives of Weick and Mintzberg, the focus moved to how entrepreneurial decision-making being made in uncertain environments cannot be rational. This study specifically focuses on the decision-making theories of causation and effectuation which were derived by Sarasvathy in 2001 and accounts for making decisions under uncertainty. Sarasvathy argued that decision making needs to be adaptive over time and responsive to change. She argues that decision making logics shift over time when early venture creation requires flexible, collaborative decision making and later venture creation requires a more planned approach like the normative model (Sarasvathy, 2001).

Causation and effectuation have gained significant interest in strategic entrepreneurship literature as they provide insights on how decisions are actually made in new ventures. Currently the literature argues that effectual logic is followed in the early stages of venture creation as this requires flexibility and working with limited means. As the venture becomes more established, it is argued that decision-making logic shifts to a causal approach. This means more planning and pre-existing goal formation as historic decision-making is typically described (Sarasvathy,2001). While there have been many articles testing when effectuation logic is used (Brettel et al., 2011; Read et al., 2009) the research focuses on the earlier stages of venture creation. Additionally, where research on later stages of venture creation has been conducted, it typically focuses on one industry (e.g Reymen et al., 2015). Consequently, the literature is lacking in the coverage of the later years of venture creation in a cross-industry approach with different levels of uncertainty.

This study aims to explore the following questions in a New Zealand context;

(1) *To what extent is Causation and Effectuation followed by entrepreneurial start-ups in years four to eight of operation?*

(2) *Does the decision making process and perceptions of market uncertainty differ across industries?*

The paper makes the following contributions. Firstly, it sets out to distinguish whether causation and effectuation is more predominant within New Zealand start-ups and whether causation is predominantly followed, as suggested, in years four to eight. Secondly, this work advances our theoretical understanding on how uncertainty drives the usage of a certain decision-making process (causation and effectuation). And finally, this work demonstrates whether key strategic decisions can shift the decision-making process being used. Summing up, the work investigates the theoretical understanding of 'how' these decision-making processes come into place in each venture and 'why' they are being followed.

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2.- Theoretical background

Prior to Sarasvathy (2001), the normative model dominated based on the notion that decisions follow a multi-step goal driven process to choose between alternatives that follow an orderly path from problem identification through to solution (Franklin, 2013). Opportunities are discovered through a purposeful search process. This is the model employed by neoclassical economics where the decision making process involves defining, diagnosing, designing and then finally making the decision (Mintzberg & Westley, 2001).

Today, this rational normative model is referred to as causation, however, many behavioural theorists had previously challenged the normative model, the notable being: James G. March, Karl. E. Weick and Henry Mintzberg (Sarasvathy, 2001).

James. G. March challenged the notion of rational goal driven decisions arguing, we cannot make decisions in terms of a goal that will only be known later. He challenges the dogma of pre-existing goals and called for better models of decision-making (Augier, 2004). March subsequently derived the theory of Garbage-Can decision-making, which focused on the meaning of choice and how it changes over time due to the introduction of new problems and changing patterns of available energy. Choice opportunity can be seen as a garbage can into which participants dump various kinds of problems and solutions as they are generated and consequently rational decision-making does not happen in reality (Cohen et al., 1972).

Karl E. Weick also argued that rational, goal driven decision-making was not how decisions are made. He said, rather, we all engage in "sense making"; which involves the ongoing retrospective development of plausible images that rationalize what people are doing" (Obstfeld, Sutcliffe & Weik, 2005, p.409). We engage in this process when the current state of the world is perceived to be different to what is expected. Instead of making, rational decisions, we search for meaning and how we make sense of the environment determines our decisions (Starbuck, 2014). He proposed that change occurred through the theory of enactment, selection and retention which is similar to natural selection results in arranging enacted experiences that allow retention of the products of successful sense-making (Weick, 1982).

Notably, Mintzberg work also challenges the rational model. Famous for his work on strategy as an emergent unplanned process, he argues that decision-making is messy and is not rational because new events interrupt the process. Mintzberg argues that 'thinking first', 'seeing into' and 'doing first' should be used in combination because understanding requires the courage to see what others cannot and to recognize things for what they are. (Mintzberg & Westley, 2001).

Causation and Effectuation

Sarasvathy (2001) sought to expand on March's questions arguing that the landscape of business was changing towards a more free-market orientated and entrepreneurial setting where decision-making becomes much more difficult and we sometimes have to make decisions before we have the rational information – "how do we make a price decision when the firm does not yet exist and there is no demand function, how do we value a firm in an industry that didn't exist five years ago" (Sarasvathy, 2001, p.244). This led to her redefining the rational approach and the emergence of effectuation. "Causation processes take a particular effect as given and focus on selecting between means to create that effect." "Effectuation processes take a set of means as given and focus on selecting between possible effects that can be created with that set of means" (Sarasvsthy, 2001, p. 45).

Sarasvathy outlined seven areas that show the differences between causation and effectuation. These are givens, decision-making selection criteria, competencies employed, context of relevance, nature of unknowns, underlying logic, and outcomes. Effectuation was a paradigmatic shift to the way we understand the entrepreneur and suggests how individuals might act in situations in which the assumptions of causal approach are not met (Edelman & Yli-Renko, 2010).

An entrepreneur with an effectual decision-making process focuses on what they can control, rather than achieving pre-existing goals. The effectual entrepreneur uses the resources they have at their disposal, and embraces uncertainty, rather than avoid it like a causal model where any change to the plan is unwelcome (Sarasvathy, 2008). In the effectuation processes there is still a predetermined goal, but it is flexible in nature allowing the entrepreneur to create one or more possible effects irrespective of their original goal and to therefore change and shape their goals over time. There is a focus on strategic alliances rather than competitive analysis of causal models that require extensive time and financial resources.

Since Sarasvathy (2001), many have sought to validate and measure the effectuation model and empirically test it (Brettel et al., 2011; Read et al., 2009). Chandler et al., (2009) validations study proved the effectuation model. There has been a consensus throughout literature that effectuation is followed at the early stages of venture creation, and causation followed once the business becomes established. The work of Reymen, et al., (2015) explored Sarasvathy's comment that causation and effectuation processes happen interchangeably, and explored when effectuation is predominately followed over causation, and vice versa. This research confirmed that causation and effectuation happen interchangeably and added that initial conditions (level of uncertainty, novelty of the market) determine the process followed, however there is always one predominant process used.

Reymen et al., (2015) found when the entrepreneur engages in strategic decisions to change the scope of their activities, such as product offerings, technologies or markets, this shifted the used of decision-making logic. The overall pattern is when the scope of the venture is widened, then market uncertainty is high and the effectuation process comes into play. Narrowing the scope of activities, therefore, leads to a particular focus that requires goal formation, perceived market uncertainty becomes low leading to usage of causation processes.

Entrepreneurial Strategic Decision

According to Shoemaker (1993) Strategic decisions are "intentional choices or programmed responses about the issues that materially

affect the survival prospects, well-being and nature of the organization" (Mehrabi & Mohammad, 2012, p.179). The four characteristics of strategic decisions are complexity, uncertainty, rationality, and control. There are numerous factors that affect strategic decision-making including, the environment, the entrepreneur's characteristics, and the decision-making process itself (Mehrabi & Mohammad, 2012).

Strategic decision-making is essential to entrepreneurial strategic management and is a viable pathway to wealth creation through increased financial returns. Therefore, engaging in the right strategic decisions and decision-making processes for the venture derives adequate strategic management and the ability to prosper and most importantly, survive (Kearins, Luke & Verreynne, 2010). However, one challenge of strategic decision making is that when managers make strategic decisions they change their perceptions of the environment to make it 'appear' more certain as a business cannot address its environments impact (Schwenck, 1984).

Personality is another dimension developed by McCarthy (2003), arguing that entrepreneurs are either charismatic or pragmatic individuals. The pragmatic entrepreneur leads to rational, goal setting or 'causal' decision-making. In McCarthy's illustrations, she found that a planned approach is used and decisions were made "very carefully" in order to reduce the risk of business failure (McCarthy, 2003, p.332). Charismatic entrepreneurs, on the other hand, had ambitious goals and welcomed risk – an effectual decision-making process. Other themes throughout literature are opportunity recognition and perception (Alvarez & Barney, 2007). Prior research says causation and effectuation are not entirely affected by the length of time the venture has been in existence. Entrepreneurial experience was proved to have no effect on the type of decision-making process entrepreneurs followed (Reymen et al., 2009). These factors are important as they do play a role in the decision-making process followed by an entrepreneur.

Effectuation clearly has a place in literature as the main decision-making tool of entrepreneurs operating in uncertain environments. However, the notion that both processes are used together, has led to some research examining when each process is used. Extant literature posits varying findings depending on the length of the process, market uncertainty, strategic decision-making and the type of entrepreneurial personality have been reached. Therefore, this research intends to focus on entrepreneurs at a later stage (years 4-8) of venture creation, across a range of industries to viz-a-viz causation and effectuation.

3.- The 'study'

This section details the research perspective; what paradigm was adopted and how this determines the research design, the methodology, data collection and analysis.

Research Perspective

This research project is qualitative and therefore typically follows an interpretivist paradigm. The ontological essence of this paradigm assumes that reality is constructed through the meanings and understandings developed socially and experimentally (O'Leary, 2014). Holding this epistemological position means as the researcher we do not separate ourselves from the research. It calls for inductive logic; appreciates subjectivities and accepts multiple perspectives and realities. Inductive reasoning involves making observations from raw data, discerning a pattern, making a generalization and then inferring an explanation or theory (O'Leary, 2014, p. 130). The value of qualitative over quantitative is that qualitative research delves into social complexities in order to truly explore and understand the interactions, processes, lived experiences, and belief systems that are part of individuals' institutions, cultural groups, and even the everyday (O'Leary, 2014).

Methodology

This paper takes a phenomenological methodological approach. This is "the study of phenomena as they present themselves in individuals' direct awareness and experience. Perception, rather than socio-historic context or even the supposed 'reality' of an object, is the focus of investigation" (O'Leary, 2014, P. 138). This epistemological position and methodology was chosen because the project required an in-depth understanding of entrepreneurs decision-making, which is challenging to achieve through quantitative surveys. Rather, in-depth discussions with each participant are needed to ask them a series of questions regarding the key elements of their business, goal setting and environment. In short, the aim was to deceiver 'how' they make decisions and why, quantitative methods could not obtain this complex information.

Research Design

Sample Description:

The research considers entrepreneurial start-ups that are operating in the later years of their business with a focus on their decision-making processes. The key question being whether entrepreneurs follow Causation and/or Effectuation processes after years 4-8 of operation and what process is the more dominant. The population was limited to entrepreneurs who continue to run their business and are heavily involved in day-to-day operations after 4 to 8 years since start-up. Five entrepreneurs, one each from the following five industries constituted the study sample; Skincare, Technology, Equine hoof care, Business Management and Food. These industries represent a diverse sample, offering varying dynamics.

Furthermore, as entrepreneurial literature focuses on the high tech industry it is relevant to explore a cross-industry approach to understand how relevant decision-making processes work in different contexts. Literature already shows how effectuation is more prominent in the early stages of a venture while causation can become more prominent later. However, the literature states that these shifts in decision-making logic can be greatly altered by the sector/industry environment and the entrepreneur's perception of its uncertainty as uncertainty is a key factor in decision-making.

Table 1: The realised sample

Participant	Pseudonym	Industry	What they do?	Motive For Entry	Years in Operation
1	A	Skincare	Sells and formulates NZ made skincare	The entrepreneurs past job experiences as well as caring about what products she put on her skin	5
2	B	Professional Services and Technology	A digital performance company that focuses on digital marketing	The founders attended a internet marketing conference and saw a compelling opportunity	7
3	C	Equine Hoof care	Team of farriers that provide hoof care services to a wide range of equine breeds and disciplines.	The entrepreneurs qualification as a farrier combined with his passion for horses	8
4	D	Business Management	Develops a online collaborative decision-making tool	The desire to solve the problem of inclusive equitable decision-making	5
5	E	Food	Makes cakes, cupcakes and other sweet treats in store and for order	The entrepreneurs passion for baking	4

Method

A qualitative study is well aligned with semi-structured interviews to collect data. Interviews are "a method of data collection that involves researchers seeking open-ended answers related to a number of questions, topic areas, or themes" (O'Leary, 2014, p.217).

The reasons interviews were suitable for this research project, is because they provide rich, in-depth qualitative data, allowing for non-verbal as well as verbal data so this means really 'seeing' how the respondent feels about something, giving the researcher a more in-depth understanding. Interviews are flexible enough to allow you to explore tangents, yet are structured enough to generate standardised, generalised data (O'Leary,2014).

For this project, a semi- structured interview was considered suitable to produce optimal insights. A semi-structured interview is an interview with the use of a flexible structure, which can start with a defined question plan but deviate in order to follow the natural flow of conversation and pursue interesting tangents (O'Leary, 2014, p.218). One – to –one interviews were seen as most suitable. These were seen necessary to give control over the process and the freedom to the interviewee to express his or her thoughts freely.

Prior to the interviews an interview schedule was devised based on the literature review and understanding of what was needed to answer the research questions. This included prompt questions as well. The questions included themes of goal setting, entrepreneurs perception of their environment, uncertainty and risk, as well as talking through a strategic decision that they made.

Data Analysis

Template analysis was used to thematically analyse qualitative data. The analysis involved developing a coding template, which summarised themes identified as important in the data set, and then organised them in a meaningful and useful manner. This involved hierarchical coding – which meant using broad themes that encapsulate more specific ones.

Once the themes were identified the data was read through and relevant segments were marked and checked with a priori themes to eventually code on the transcript. All transcripts were analysed and this template served as a basis for interpreting the data set.

4.- Findings

In this section, the findings are discussed key themes extrapolated from each case.

Table 2: FINDINGS

Pseudonym	**A**	**B**	**C**	**D**	**E**
Industry	Skin Care	Professional Services and Technology	Equine Hoof Care	Business Management	Food
Products and Services	NZ made skincare	Digital Marketing services	Farrier services	Collaborative decision-making tool	Speciality cakes and other baked goods
Years of Operation	5 years	7 years	8 years	5 years	4 years
Industry dynamics	Competitive	Very dynamic & competitive	Competitive, high demand	Little competition, niche market	Little competition
Perception of Environment	Currently uncertain with substantial risk	low risk, some uncertainty	low risk, low uncertainty	low risk, low uncertainty	low risk, low uncertainty
Personality of Entrepreneur	Charismatic	Pragmatic	Charismatic	Pragmatic	Charismatic
Level of Goal Setting	Low	High	Low	High	Low
Open to Change?	Yes	Yes	Yes	Moderately	Yes
Frequency of Goal Setting	Low	High	Low	High	Low
Competitive or Cooperative?	Competitive	Both	Cooperative	Cooperative	Cooperative
Personality Driven?	Yes	Yes	Yes	Yes	Yes
Embraces or Avoids Uncertainty	Embraces	Embraces	Embraces	Embraces (somewhat)	Embraces
Takes Opportunities	Yes	Somewhat	Yes	somewhat	Yes
Dominant Process (Effectuation/ Causation)	Effectuation	Causation	Effectuation	Causation	Effectuation

The findings show that three out of five businesses use effectual decision-making logic in their business. Interestingly, I have extrapolated different findings than what was expected. The following section breaks down the key findings under the key themes of goal setting and flexibility, environment and strategic decision-making.

Business A

· *Goal Setting and Flexibility:*

Business A follows an effectual decision-making process. This entrepreneur has an overarching goal for her business though the way she goes about it is subject to change;

"the way we are going to go about doing it kind of unfolds down the track".

She says she welcomes change and understands the importance of learning. Entrepreneur A understands that things disrupt the plan and therefore she must be agile, she voices;

"like yesterday we found out that the new product we just launched, 10% of the caps are broken". "it's totally ok to change your course".

She holds a general belief that too much planning is not a good thing and strongly believes in using her gut to make decisions.

"you can do all the analysis and preparation in the world but sometimes that will be quite, I want to say halting, it like halts your progress and if you don't take that first step then you're never going to get anywhere, so there's a balance of looking at everything with a magnifying glass and getting out and doing it and going with your gut feel".

To this entrepreneur it is important to have an underlying goal, though she believes in following her gut and let the process of achieving this goal and the formulation of new goals to be organic.

· *Environment:*

Entrepreneur A views her business environment as competitive. This entrepreneur believes in conducting a competitive analysis to find ways she can compete. However, her industry is characterised by recent changes from external influencers like Facebook and Instagram. Changes to Facebooks algorithm means entrepreneur A perceives her industry as risky at the moment, with an air of uncertainty.

· *Strategic Decision-Making:*

Entrepreneur A made a recent strategic decision to produce a new product. Explaining how she came about this decision came from her personal interests as well as communicating with her customers about their wants and needs. She factored quite a lot into this strategic decision, such as her personal strengths, what she needs help with, how she will market the product, how to formulate the product etc. Each decision was made primarily with her gut feel and she let this new product development unfold organically and dealt with decisions as they arose.

Business 'B'

·*Goal Setting and Flexibility:*

The above table shows Business B predominately follows a causal decision-making logic. There is extensive goal setting and structure at Business B that is guided by their formalised vision and values. These goals are formulated in all functional departments with set KPI's and accountability structures set. Goals are set yearly and must be agreed on between the founder's, their desires, the board and shareholders. However, Entrepreneur 'B' explains that even though goal setting is extensive and they follow a planned process in order to achieve each goal, they must still remain agile and flexible.

"it's a balance in a small growing business and in our industry when a new technology comes out and you have to be over it. You need a model that can always be a bit agile and adapt, but at the same time you need process and structure around it".

Entrepreneur 'B' voices that the growth of the business means they now need to be stringent on taking the opportunities. Therefore, although they are flexible and recognize the opportunities around them, they need structure and a plan:

"if there is more structure, we can't manoeuvre as much".
"now we need to be strategic and have something to pin everything to."

· *The Environment:*

According to Entrepreneur B the industry that their business operates in is very dynamic. This is because they need to operate as a professional services company but in the tech space. The entrepreneur voices that this is hard to balance:

"one is a rigid model and the other a lot of disruption. So two things colliding that don't make sense".

The biggest issue for business B is that they are at the mercy of big tech players like Google.

"they could change the rules overnight so you need a model that can adapt with that".

Entrepreneur B voices issues on the effect that new technologies have on the business. These have a huge impact on how people interact with websites and digital advertising that in turn affects the business. Interestingly, Entrepreneur B does not see much concern in these risks, and does not see much uncertainty in the business' industry. Entrepreneur B believes in having the right business model, to be one step ahead and this then reduces the risk. He voices;

"so when it happens you can quickly adapt and move and hire people who love that space. So you build a culture move and adapt."

Though, operating in an industry characterised by disruption and competition, Entrepreneur B is happy to form partnerships and alliances with others. While working with others has enabled fast growth and success Business B still engages in a competitive analysis and strives to outwit competitors.

S·trategic Decision-Making:

Business B engages in a lot of strategic decision making. However, regardless of the type of decision their decision-making logic does not change. A strategic meeting is held each week that takes all big decisions to a monthly management meeting that looks at financials, marketing etc. Following that a business proposal is completed and then clear performance KPI's around the decisions are formulated. Entrepreneur B says that there is the same planned structure and accountability for all decisions. There is little gut feel and no emergent nature for decision making as business B has a corporate structure of boards and shareholders.

Business 'C'

·*Goal Setting and Flexibility:*

At business C goal setting is done differently compared to other participants in this research. Entrepreneur C has a set of personal career goals. Such goals are entrepreneur C's desire to make a change in the equine industry and educate those in the industry on good hoof care. Entrepreneur C wants to develop strong apprentices who will practice sound practices in their careers, too. These goals are visionary in the Equine Hoof Care industry.

However, general goal setting at business C is not extensive, nor is there any plan or structure in place regarding 'how' these goals will be achieved.

"I have one goal and then I have the next goal in my head".

Entrepreneur C lets the achievement of goals and the formation of new goals organically unfold. Entrepreneur C welcomes change,

though change isn't something he loves. Rather, he believes change is inevitable and therefore it must be accepted. To entrepreneur C, when a negative event happens disrupting the achievement of a goal, he try's something new to achieve that given goal and he is even more determined to achieve it.

· *Environment:*

The Equine Hoof Care industry is highly competitive, entrepreneur C voices: " *its not easy to be in*".

Although this industry is characterised by many competitors who do not work together often, entrepreneur C is happy to work with others, expressing:

"id work with anyone. I'm not too proud to. If I think they are going to be good for us".

Entrepreneur C does not perceive this industry as risky or uncertain. He says there is always demand for farriers, and the business grows money:

"If a horse is shod it will have to be done again 6 weeks later".

To entrepreneur C there is nothing that can fundamentally disrupt the Equine Hoof Care industry.

· *Strategic Decision-Making:*

Entrepreneur C made a strategic decision that stemmed from his vision. Though, explaining how this decision came about, entrepreneur C described how he initially had other plans to achieve his vision of educating those in the industry. The way he went about this decision unfolded as events occurred around him. He made this decision by taking a opportunity he recognised. This decision was not planned out, the enactment of it naturally unfolded with time.

Business 'D'

· *Goal Setting and Flexibility:*

Business D engages in extensive goal setting that is guided by their long term mission. Goals are set annually and then quarterly, these must be approved of by the board. Entrepreneur D communicates that their business is open to change and agile, though does not believe in changing too quickly or too much:

"If you try something new and change too quickly because you fear it might not work you didn't implement it enough to see success or failure."

"Change is high cost and hard to get everyone on board, and slow."

· *Environment:*

Entrepreneur D describes their business' environment as dynamic. They serve a niche market. There is not much competition, only competitors that do 'similar' things. Though Entrepreneur 'D' does not believe in competing:

"I welcome other players in this space cause the more we can do that the better the society we're going to have".

However, entrepreneur 'D' elaborates;

"I think the only reason I'm not worried about it because I don't think any people would make this tool because the design of it comes from a deep connection from certain kind of processes from collaborative groups which we are. That a very profit focused or mainstream company would never think of this or see the value of this. I don't think they would and that's why they haven't."

· *Strategic Decision-making:*

Business 'D' engages in strategic decision-making often. However, regardless of the type of decision conducted, the process remains the same. Decisions are guided from the top level goals of the year and the people in each group are held accountable for decisions in their area. Key strategic decisions that affect the survival prospects such as capitalising the business, go straight to the board for approval. Therefore, big decisions remain structured at business 'D'. however, entrepreneur 'D' communicates that though big strategic decisions require boards approval and are accountable to certain members of the business, the process of making a decision shifts depending on the decision made.

"We try be really conscious of different levels of decision making and when someone should be empowered to just do something".

Entrepreneur D believes that people should sometimes use their judgement in decision-making. She also voices that when strategic decisions are being made, business D gathers experimental evidence to see how that decision will pan out;

"we gather experimental evidence. We do the lean start up approach- the smallest thing we can do to test this".

Therefore, even though business D's strategic decision-making is guided by the formalised goals, strategic meetings and must be approved by the board at times, entrepreneur D still believes in experimenting and learning whilst engaging in strategic decision-making.

Business 'E'

· *Goal setting and Flexibility:*

Entrepreneur E is very attached to her business and produces goals that are two fold. Goals stem from her personal wants and also what is best for her business. However, she does not communicate any underlying goals, rather formulates goals as she goes along, voicing;

" when we started the goal was to survive, after a while the goal changed and we realised we were doing quite well, the goal changed a bit and it became to open the retail shop and then, when we had the retail shop the goal became to open another one."

Now that business 'E' has substantially grown in size, goals are still flexible. Entrepreneur E is very happy to change her goal if she sees a

good opportunity – change does not worry her, she would rather take the opportunity than miss out on something great. Though, because entrepreneur E has a strong personal attachment to her business, if something were to come and disrupt a goal she would take it quite personally.

· *Environment:*

Entrepreneur E perceives her market as low risk with little uncertainty. This is because to entrepreneur E competition is not extensive with only three to four direct competitors. She does not worry about the competition because in her view each competitor has their own strengths. Entrepreneur E is happy to work with others and it is evident she does not have a competitive personality:

"If someone comes and asks for something other people will do better than me, I'll send them to the other cake people"

However, entrepreneur E admits that there has been a few more competitors popping up. Though she is not worried because she believes business E has its own unique product offering that will offset any increases in competition or current trends. Entrepreneur E also expresses social issues that could be seen as a threat – one example is the sugar debate that she admits could put people off baking. Though, once again she is not too worried and views her market as stable.

· *Strategic Decision-Making:*

Business E engaged in a strategic decision that was to open a new store. Entrepreneur E says this goal was one of her step goals, though she had no plan in how she would go about this decision. Entrepreneur E shows no sign of a causal approach to this decision, rather it happened organically and she made decisions as they occurred.

She did not perceive this decision as uncertain, rather entrepreneur E said she felt comfortable widening her scope as she is a local of Wellington and knows where the competition is and what kind of customer she would expect at her new shop.

5.- Discussion

Understanding how entrepreneurs make goals, and achieve them was the first major theme of this research.

Effectuation processes.
While Business A has an overarching goal, how she achieves it and the sub-goals she develops in between are not set. There is no plan – it unfolds down the track. This entrepreneur does not believe in too much analysis and preparation and (she) would rather follow her gut feel and take the opportunities she sees. Business B was much the same with goal setting being personal and visionary. They were career goals in different and unique areas that have no set plan to get there. Additionally, Business E' s goals were two fold, both personal and business goals. They formulate in time and are flexible.

All entrepreneurs welcomed change and saw it as an opportunity, citing that you need to be flexible in business and change does happen. We can infer these three businesses follow an effectual decision-making process. The sample does not fully match Sarasvathy's (2008) claim that businesses following an effectual process are more likely to engage in strategic alliances rather than competitive analysis that require extensive time and resources.

Business A, an effectual entrepreneur, adamantly engages in competitive analysis. She is most probably the participant who engages in these processes more interchangeably than the other participants who are viewed as purely effectual. To her this is necessary, she needs to compete with others- there's no one rationale for this, rather than the reoccurring theme of personality- it is in her personality to do so.

On the other hand, businesses C and E both engage in strategic alliances, once again, not because they don't have the time and resources to undertake a competitive analysis, but because it is their personality to work with others. Business C sees it as a way to learn and welcomes it typically in an industry where most players would not engage in this kind of alliance as it is characterised by competition. Business E is not a competitive person. She would rather recommend competitors to customers whom she thinks can do a better job than her on a specific product, highlighting the personality aspect, again. Though they are still relatively young, these businesses are established, and none is in the position of merely trying to survive anymore. Therefore, Sarasvathy's (2001) resource debate of a competitive analysis does not hold true to this sample.

On the other hand, Business B and D were quite different. These two businesses had a lot of formalised structure in place regarding goal setting. These businesses set out to achieve the pre-existing goals which have been formulated through many meetings with boards, owners and shareholders. These goals are put in annual plans and are organised to achieve with key KPI's, accountability structures and so forth. This is evidently a causal decision-making model. Interestingly, Sarasvathy (2001) says that businesses following a causal process do not welcome change in their plan and are likely to engage in a competitive analysis. However, the reoccurring theme of personality shows this not to be true. Business B strongly believes in being agile, stating that they need to be as a growing business and the industry they are in. However, to them this doesn't stop goal setting and performance targets being formulated, it just makes them alter their model and produce change if they need to. While they take a predominately competitive stance in the market, business B had many strategic partnerships in place too.

Whilst, Business D was more set on each goal, voicing the drawbacks of change and how things needed to be tried long before there should be any change. Also, business D believes purely in a collaborative approach and no competition. This stems from the business being collaborative in nature and the personality of those that run it. Therefore, Sarasvathy's (2001) claim does not hold true here that when causal processes are dominant, flexibility and alliances are not followed. It ultimately comes down to the business and the people running it.

Shoemaker (1993) said that strategic decisions are "intentional choices or programed responses about issues that affect the survival prospects, wellbeing and nature of the organisation" (Mehrabi & Mohammad, 2012, p.179). Reymen et al., (2015) said that when the scope of the venture is widened then market uncertainty is increased and the effectuation process is used and narrowing the scope of activities leads to particular goal formation, with perceived market uncertainty low and therefore a causation approach is used. However, this study found that regardless of the scope of the strategic decision, the decision-making process did not change. For example, while business A, C, and E all made decisions with effectual logic, they did not use effectual logic because of increased market uncertainty, but because of their personality and how they always run their business. Business B is another example of entrenched personality driven behaviour - a causal decision-making process is always used even when a strategic decision with increased market uncertainty may call for effectual logic. Causal logic has always been used because that is how they run their business and deal with uncertainty, they plan, set goals to deal with this.

This study emerges the theme that the environment does not determine what decision making process is followed; the entrepreneur, their subjective opinions, the business itself is what determines it. This reaffirms Reymen et al., (2015) who researched IT firms at the later stages of venture creation finding they followed causal decision-making. One IT firm in this study affirmed this as they followed Causal approach too – however from this one interview in each industry it is not possible to say if the industry makes Business B use causal decision-making, it is how the business has always been structured and who runs it. The founders, who operated purely effectually in the very early days, structure their business model around consultants who mentor them and well known business books. They decided to follow this route. Importantly, they believed as they got bigger they needed to have more structure in place.

Another interesting finding was that business A perceived her industry as risky and uncertain because of external influencers like Facebook and on the other hand Business B saw the effect that players like Google can have on their business creating a small amount of uncertainty and risk. Finally, Business C in an industry characterised by competition and excessive supply, found no risk or uncertainty surrounding this. The resulting theme seems to be that in businesses operating in risky or uncertain markets, it can come down to the subjective opinion and personality of the entrepreneur that determines how they view the environment and their response to it. This study finds no correlation between the perception of uncertainty and what decision-making process is followed.

It was suspected if any of the firms were to continue an effectuation process it would be the younger participants. But this was not the case, one 8 and one 5-year old firm were effectual process users and this signifies that time horizon of operation is not necessarily a factor in this research as to what decision-making process is followed. In the end it is suitable to say that personality, subjective opinions and perceptions appear to ultimately guide the decision-making process used in this context.

6.- Conclusion

This qualitative study sought to answer to what extent is Causation and Effectuation followed by Entrepreneurial start-ups in years 4-8 of business? It took a cross industry approach asking does the decision-making process differ across industries and perceptions of market uncertainty.

Three of the five participants in this study follow effectuation decision-making process and two participants follow the causation process. Interestingly, two out of three of the effectual entrepreneurs showed little signs of causal decision-making, whilst the other shows some use of interchangeably using these two processes. On the other hand, the two causation entrepreneurs show elements of using effectual processes. This study affirms that these processes are used interchangeably by some entrepreneurs. With just one business in each of five different industries and a mix of causation and effectuation approaches it is not possible to say whether industry per se affects the model employed. Instead it was clear that subjective opinion of their market guided their decision making and the most important impact on the process used was the personal characteristics of the entrepreneur, their personality, opportunity recognition and ideals of running a business. The research supports personality based themes of entrepreneurial decision making, rather than scoping decisions and perception of market.

limitations and implications of the study

The major theoretical contribution of this research is that this study has found that not all firms in the later stages of venture creation follow a causal decision-making logic. Instead, this research has surfaced other themes regarding decision-making; which are personality, opportunity recognition and the ideals of running a business. Practically, this research provides an understanding of how, in reality, entrepreneurs are not making decisions directly in line with the amount of years their business has been operating, and in fact, decision-making is a much more complex and subjective matter.

This research presents few limitations. Self-reported data has the possibility of biases, however, this was controlled by having semi-structured interviews that were designed to make the interviewees talk on how they felt and what they thought on various routines. Secondly, the small sample meant we were unable to generate significant insights regarding the correlation aspects of industry dynamics and perceptions of uncertainty. Conversely, initial understandings spark interesting conversations for specific and large-scale research on entrepreneurial decision making within New Zealand.

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The State of Markets for Technology in Chile

Goretti Cabaleiro[1], Felipe Salce[1]*

Abstract: The purpose of this paper is twofold. First, we show the importance of having a developed Market for Technology and how innovation affects countries' economic development. Second, using the main innovative indicators, we describe the current Market for Technology in Chile and discuss its possible impact on the country's economic development.

Keywords: R&D expenditure; Patent licensing; Markets for Technology; Intellectual Property Rights; Chile

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1. Introduction

Innovation management has proven to be an important factor in economic development in the last few decades, and its importance is expected to increase exponentially in the era of Artificial Intelligence (IA) and Automatization. Therefore, governments and companies have attempted not only to improve the knowledge and understanding of present innovative output processes, but also to determine how to adapt them better for the future. In particular, recent studies show that IA will change our lives significantly: 51% of the jobs will be automated in 2030; 15% of the new sold cars in 2030 will be fully automated; and cities will become intelligent, and our future everyday lives will be different due to the predominance of the Internet of Things (IoT) (Mckinsey & Company, 2016).

In this context, characterized by increasing competition in the product market, shorter product life cycles and very fast development of IA, companies cannot produce everything by themselves. As a consequence, new ways to manage innovation have emerged, but not all countries seem to be conscious of the importance of this change and its implications. In particular, companies have switched from innovating only through internal R & D to buying and selling technology and know-how in Markets for Technology (MFT). To be efficient and competitive, companies have increasingly begun to rely on networks, new entrants and technology-based firms. These new relationships mean that, each year, MFT become more and more important for countries' economic development.

Although the US and Europe have produced studies to quantify the importance of MFT (Arora et al., 2001; Athreye & Godley, 2007; Robbins, 2009) and their main determinants (Arora & Fosfuri, 2003; Gambardella et al. 2007; Zuniga & Guellec, 2009; De Leon et al., 2017), there are still no such studies for Chile. We believe that the main reason for this lack of studies is Chile's traditional deficit regarding innovation and, as a result, the absence of comprehensive indicators to measure innovation processes. Therefore, we consider that there are two things that are highly needed for Chile. The first is to create awareness about the impact that innovation has on most important economic variables; and the second is to demonstrate the low level of development of Chile's Markets for Technology or, at least, the absence of indicators that might demonstrate the opposite.

The rest of the paper is organized as follows. Section 2 will review the literature that relates innovation with the main economic variables and the theory regarding MFT. Section 3 will summarize the situation in Chile regarding the main innovative indicators. We conclude in Section 4.

2. The importance of Innovation and the development of Markets for Technology (MFT)

The literature has shown that innovation is positively correlated with countries' economic development and total productivity (Hall & Rosenberg, 2010). Since Adam Smith, in the 18th century, economists have been interested in the role that innovation plays in economic development (Agrawal, 2001). In that vein, Solow (1957) and Fagerberg (1994) conclude that innovation is a key contributor to economic progress. Romer (1990) shows that technology, the development of human capital, and R&D are important inputs for economic growth. On the empirical side, Wu (2011), using data from China, finds that R&D intensity has a positive effect on innovation and, in turn, that innovation affects a country's economic growth positively. Pradhan et al. (2016), using panel data from the euro zone between 1961 and 2003, provide results along the same lines. Furthermore, Rouvinen (2002), using data from the OCDE, concludes that R&D expenditures take, on average, four years to influence economic growth, and he shows causality between R&D investment and the TFP and not in the other way around.

In studies related to productivity, Griliches (1987) shows that R&D activities can explain 75% of productivity growth rates. Benaventa (2006), Alvarez et al. (2010) and Crepon et al. (1998) show that R&D expenditures are positively related to firm size, market share and diversification, and they find a positive correlation between productivity and higher innovation performance. In a similar study for Italy, Parisi et al. (2006) demonstrate that the innovation process has a positive impact on productivity and that R&D expenditures are strongly and positively related to the likelihood of introducing

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new products in the market. Thus, they conclude that R&D affects productivity growth because it facilitates the understanding of new technologies.

Therefore, based on previous results, there appears to be a consensus regarding the positive impact of innovation on economic progress and productivity. Since managers know the crucial role of innovative technology knowledge in firm performance and economic growth, they have put much effort into protecting it. In fact, according to OROPO (2015), in June 2015, there were approximately 20 million patents in the world. However, patenting does not imply receiving benefits from the innovation since companies do not use the most of their patents. For instance, a survey made by the Japan Patent Office shows that more than 60% of Japanese patents are not used at all, while 30% are used internally and almost the 10% are licensed (JPO, 2004). Given the great number of unused patents and the cost that that implies, companies have shift to a more open model of innovation, whereby they can buy the technology that they need to push forward the innovative process, or they can sell the patented technology to benefit from it somehow. In that sense, licensing agreements have become an important way to transfer technology. In particular, licensing consists of an agreement between the patent holder (licensor) and the other party (licensee), through which the licensor allows the licensee to make, sell and use the patent without transferring its ownership through the Markets for Technology (MFT)[1] (Granstrand et al., 1997). Due to technological convergence, increasing interdependence of different technologies, and the resulting need to rely on diverse technological components for downstream products and services MFT has dramatically expanded in the last two decades providing access to third- party technologies.

Several studies have noticed the increasing trend toward MFT and have quantified their extension during the last two decades. In particular, Arora and Gambardella (2001) estimate that in the mid- 1990s, the annual value of transactions in the market for technology was $25-35 billion in the United States and about $35-50 billion globally. Robbins (2009) estimates the size of the 1997 worldwide technology market at about $31.8 billion. Athreye and Cantwell (2005) quantify the 2000 world technology market at $90-100 billion. A survey by the British Technology Group (2006) estimates the size of the market for technology to be $25 billion in North America, $6.6 billion in Europe and $8.3 billion in Japan. Therefore, at the aggregate level, markets for technology have grown significantly over the last decades, and they appear to be most developed in the United States, followed by Japan and then Europe. There is no such study for Chile.

The development of MFT is important for a country because they allow the diffusion of innovative knowledge and, thus, offer opportunities to innovate beyond internal R&D and, in turn, to develop economically. If we follow economic theory, R&D has a positive effect on the growth of sales and, in turn, on the growth of companies (García-Manjón & Romero-Merino, 2012). However, sometimes investing in internal R&D and patent protection is time-consuming, companies could not have the necessary inventory capacities (e.g. human capital or infrastructure), the financial resources for developing the product, or the legal capacities to settle patent infringement lawsuits in court. Moreover, maintaining patents over time implies a cost and, depending on the use that a company makes of the patent, the cost may be worth it or not. In this sense, licensing-in can facilitate the process. In general terms, licensing agreements are positive for society since they provide strategic advantages for licensors and licensees. On the demand side, licensees can benefit from acquiring externally developed and proven technologies (Atuahene-Gima, 1993); from reducing the risks and costs related to product development (Lowe & Taylor, 1999); and from adopting more diversified and less integrated R&D structures (Chesbrough, 2003). On the supply side, licensors increase the possibilities of recovering the investments and generating revenue from innovations (Arora & Ceccagnolli, 2006; Teece, 1986); achieving rapid market penetration (Lei & Slocum, 1991); and facilitating the development of complementary products (Shepard, 1987). Given its advantages, licensing has become the most important option to transfer technology (Anand & Khanna, 2000; Arora & Fosfuri, 2003). In fact, given its significance, the U.S. Department of Justice has defined markets for technology as *"markets that consist of intellectual property that is licensed and its close substitutes"* (U.S. Department of Justice, 1995).

Despite the growth in their use, licensing agreements are still confidential in most countries, and it is not compulsory for companies to report them as a separate item on their income statements. As a consequence, innovation at the country level is still measured using R&D expenditures or the number of patents granted in a given year, regardless of whether the patents are used and without knowing what company is using this knowledge. These practices make it difficult to measure the effect of innovation on a country's economic development and productivity rate.

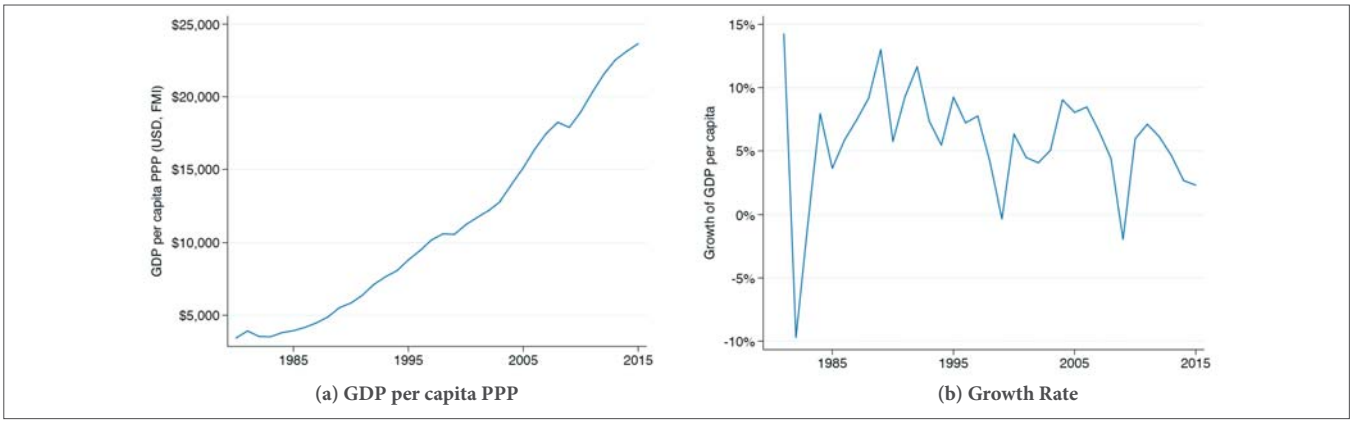
3. Literature Review: MFT in Chile

3.1. Actual economic situation in Chile

Although Chile has sustained economic growth over time, in the last decades, that growth has accelerated, with a primary focus on the extraction of natural resources, mainly mining (De Gregorio, 2009). However, nowadays, the Chilean economy is facing a deep slowdown in terms of GDP per capita. Using data from the Central Bank, Figure 1 shows that between 1980 and 2011, Chile's per capita GDP increased steadily. However, over time, the increases became smaller, so in economic terms, the Chilean economy was actually slowing down. Moreover, we observe that economic growth was lower than 3% in the last three years and that the Central Bank's projections indicate that the rate will not exceed 4% in the next five years.

(1) Markets for technology refer to transactions for the use, diffusion and creation of Intellectual Property Rights (IPR).

Figure 1: GDP per capita PPP (USD, FMI) and growth rate.



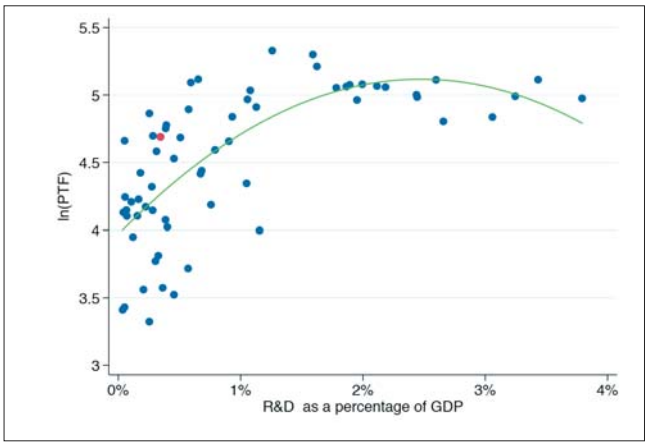
(a) GDP per capita PPP **(b) Growth Rate**

Source: Own elaboration based on data from the Central Bank of Chile.

In terms of productivity, Bravo-Ortega et al. (2014) find that Chilean companies that invest more in R&D are more likely to become export companies and that R&D spending affects productivity in two different ways: (i) directly and (ii) indirectly through exports. Using data from the World Bank and Fernández-Arias (2014) for IADB, we estimate the relationship between productivity and expenditures in R&D as a percentage of the GDP of different countries between 1986 and 2011. Figure 2 shows the low average productivity of Chilean companies. These results are consistent with those obtained by Benavente (2004) for the period between 1985 and 2000. In particular, we observe the comparison of both estimates in Table 1, where Model 1 corresponds to the model estimated by Benavente (2004) and Model 2 to the one that we estimated. Finally, the econometric model can be observed in Equation 1.

$$\ln(TFP) = \alpha + \beta \cdot \frac{R\&D}{GDP} \qquad (1)$$

Figure 2: Relationship Between Productivity and R&D Expenditure (1996 - 2011)



Note: Natural Logarithm of the TFP constructed as the average of the natural logarithm of the TFP per year, between 1996 and 2011; data obtained from Fernández-Arias (2014). R&D constructed as the average of R&D as a percentage of GDP between 1996 and 2011, for the countries and periods for which there was information in the World Bank database.

Source: Authors' own elaboration based on data from the World Bank and Fernández-Arias (2014).

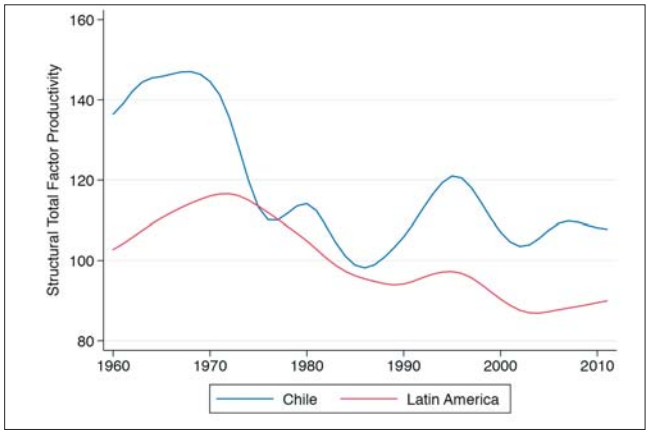
Table 1: Results

	α	β	R^2
Model 1	5,8	0,2	0,4
Model 2	4,2	0,3	0,4

Source: Authors' own elaboration based on Benavente (2004) and data from the World Bank and Fernández-Arias (2014).

Using data from Fernández-Arias (2014), we can observe the productivity of Chile and of other Latin American countries since 1960. Chile's productivity decreased by 21% between 1960 and 2011 and by 0.6% since 2000. If we compare Chile with Latin America, we observe that Chile's productivity has surpassed the Latin American average since the 1980s, as shown in Figure 3.

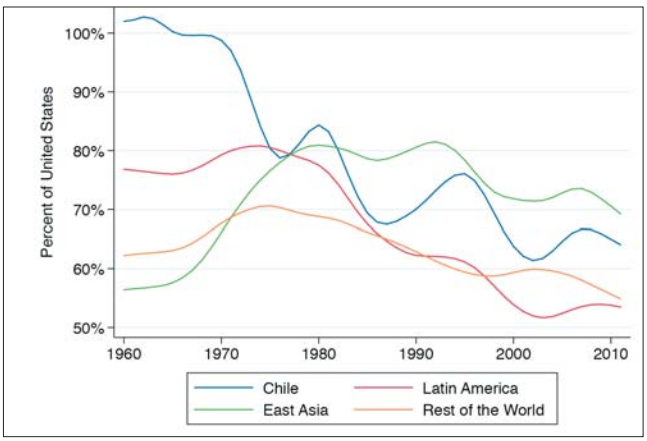
Figure 3: TFP Chile and Latin America (1960 - 2011)



Source: Authors' own elaboration based on data from Fernández-Arias (2014).

Furthermore, using the same data from Fernández-Arias (2014), we can observe Chile's productivity as a percentage of the United States'. In Figure 4, we compare it with the average productivity in Latin America (including Chile), the rest of the world, and East Asia as a percentage of the United States' productivity. It is easy to observe that, in all cases, there has been a large drop in productivity in relation to the United States, with Latin America the most affected. Chile is currently well above the average for the region and the world average, but below that of East Asia.

Figure 4: TFP Chile, Latin America, East Asia and Rest of the World as Percentage of United States TFP (1960 - 2011).



Source: Authors' own elaboration based on data from Fernández-Arias (2014).

Finally, Corbo and Gonzalez (2014) estimate the contribution of TFP to GDP growth in Chile in the last 30 years using data from the Central Bank and the Instituto Nacional de Estadísticas (INE) of Chile (Table 2). It can be seen that the contribution is negative in the last fifteen years, after having had good productivity in the 1990s.

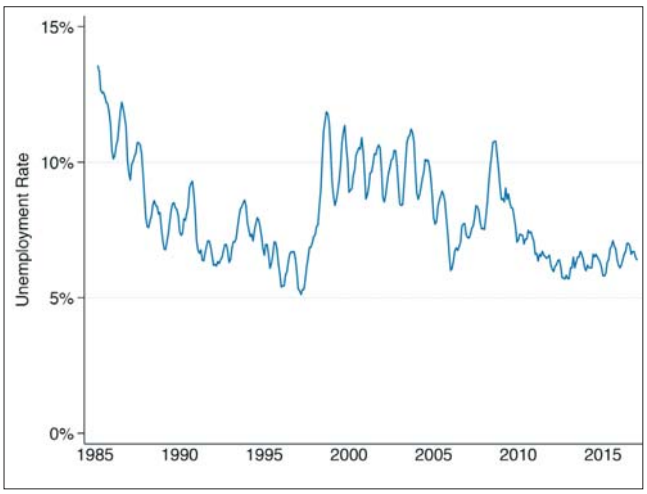
Table 2: Sources of Growth 1987-2011

	GDP Growth	Contribution of Non-ICT Capital Services	Contribution of ICT Capital Services	Contribution of Total Capital Services	Contribution of Labor Services	Contribution of TFP Growth
	(1)	(2)	(3)	(4) = (2) + (3)	(5)	(6) = (1) - (4) - (5)
1987-2012	5,5%	2,3%	0,9%	3,2%	1,9%	0,4%
1987-1991	7,0%	1,8%	0,5%	2,3%	2,8%	1,9%
1992-1997	7,6%	2,9%	0,9%	3,8%	1,8%	2,0%
1998-2003	3,1%	2,0%	0,7%	2,7%	1,4%	-1,0%
2004-2008	5,5%	2,2%	1,6%	3,8%	1,9%	-0,2%
2009-2012	4,0%	2,4%	0,5%	2,9%	1,9%	-0,8%

Source: Corbo and Gonzalez (2014)

Regarding the relationship between innovation and employment, Benavente and Lauterbach (2008) using data from 1998 to 2001, show that product innovation positively influences employment in Chile. Also, Alvarez et al. (2011a), using data from Chilean companies, conclude that product innovation could be positively related to an increase in employment, independent of the size of the firm. Furthermore, they analyze the relationship between innovation and employment and find that R&D internal expenditures positively affect employment for both qualified and non-qualified workers. Moreover, Zuniga and Crespi (2013) analyze the impact of innovation strategies on the increase in employment in three countries: Argentina, Chile and Uruguay. In particular, they distinguish three different strategies: internal R&D only; only buying R&D (licensing in patents or know how, etc.); and internal R&D and buying R&D simultaneously. They find that companies with only internal R&D have a greater and significative positive effect on the employment rate, followed by companies that implement a mixed strategy (internal R&D and buying R&D). In particular, Figure 5 shows the unemployment rate in Chile in the last thirty years, with data from the Central Bank of Chile. Even though the unemployment in Chile seems to be quite volatile, it is important to note that the variations correspond to small percentage changes, with a slight downward trend in the last thirty years. Moreover, unemployment has remained between 5.5% and 7.5% over the last five years.

Figure 5: Unemployment Rate in Chile (1985-2017)



Source: Authors' own elaboration based on data from the Central Bank of Chile.

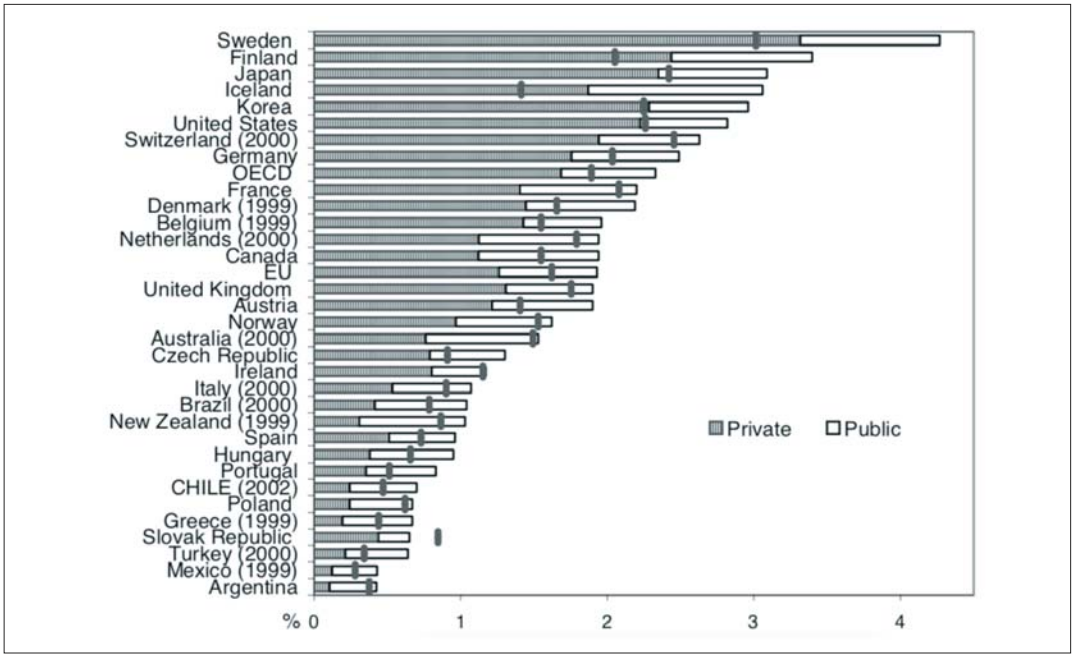
3.2. Actual situation in Chile regarding the development of MFT

In the last three decades, innovation management has become a very important part of the agenda in developed countries. Governments and companies have put great effort into acquiring the knowledge and un-

derstanding to complement the existing indicators of innovation process outputs. Indeed, it is important to know not only the input needed to innovate—R&D expenditures—but also the output of the innovative process. For this purpose, the most common indicators at the country level are: (i) the number of annual patent applications; (ii) annual patent grants; (iii) annual licensing agreements; (iv) active patents and licenses (portfolio); and (v) annual licensing revenues (Abud et al., 2013). The above five indicators will help us to understand the entire innovation process since the input represented by the R&D expenditures to their economic implication represented by revenues.

Regarding the innovative input measures at the country level, R&D expenditures in Chile are low. In fact, Alvarez et al. (2011b) state that analyzing Chile is interesting because of its delayed development relative to the rest of the developing countries in terms of initiatives and policies to innovate: Chile's R&D expenditures represent just the 0.68% of GDP, a percentage that represents less than 40% of the OECD average and that situates Chile just ahead of Mexico, Argentina, Poland and Turkey (OECD, 2007). In the same vein, Maloney and Rodríguez-Clare (2007) offer evidence that Chile suffers from an R&D investment deficit. In particular, Figure 6 shows the level of R&D in OECD member countries, divided into public and private investment in 2001. In that figure, we see that R&D investment in Chile is half the OECD average. Given this, experts assert that, given the per capita income level of the country, R&D investment in Chile should be much higher (Alvarez et al., 2011b). Following the same path, Cruz (2008) argues that although Chile present a low level of innovation, the country has been advanced slowly. Finally, Canales & Álvarez (2017) show that there are obstacles, such as financial restrictions and the low availability of human resources and information on markets and new technologies, that reduce the likelihood of innovation of Chilean companies.

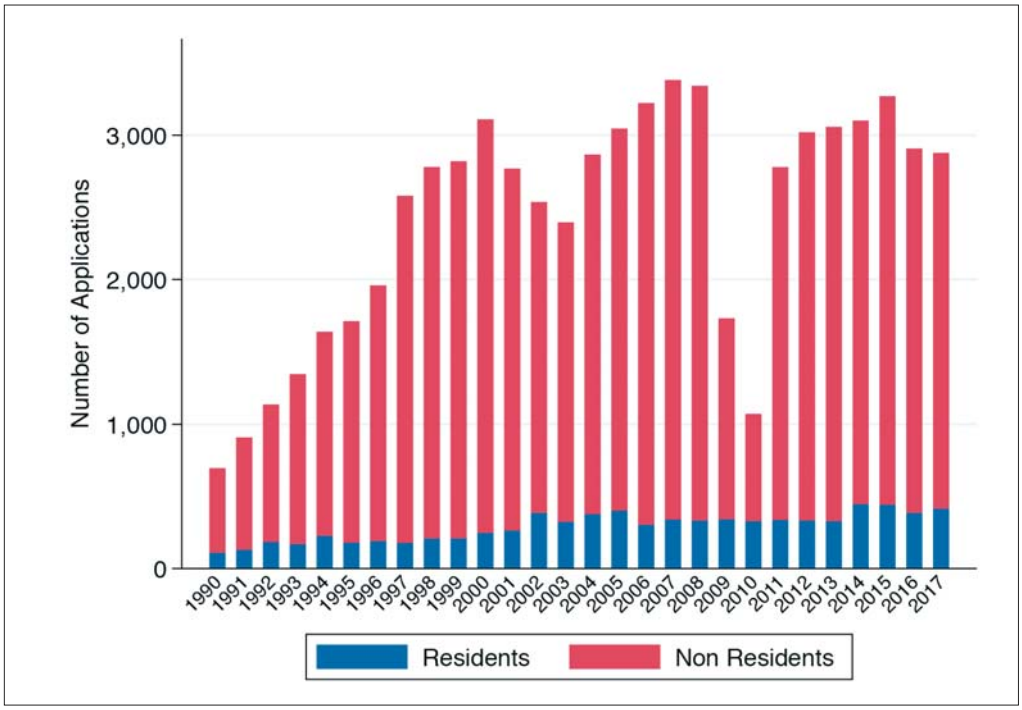
Figure 6: R&D intensity as a Percentage of GDP (2001)



Source: Benavente et al. (2005)

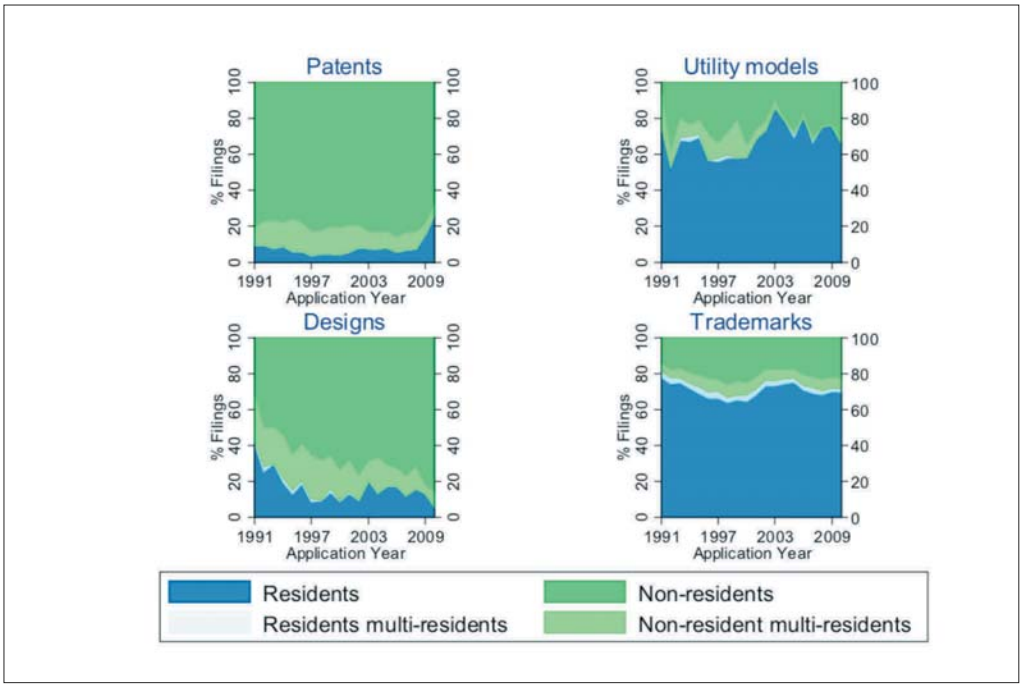
Regarding the output measures, Chile does not provide comprehensive or comparable information for all of them. Regarding the first and the second measures—the number of annual patent applications and the annual patent grants—information is available from the National Institute of Intellectual Property (INAPI). The number of annual patent applications tripled in the period from 1991 to 2010; in 2009 and 2010, they showed a dramatic decrease, and, after recovering, they have decreased slightly again in the last two years. In addition, the number of resident patent applications grew very slowly over time, averaging 290 applications per year between 1990 and 2017 (Figure 7). In general terms, more than 90% of the applications are from non-residents in the country, generally from the US and Europe, and most of the requests come from multinational pharmaceutical firms and chemical companies (around 60%). This scenario differs from that in developed countries. In Figure 8, we observe a breakdown of the applications for patents, industrial designs, utility models and trademarks. Here, we see that most of the patent and industrial design applications come from non-residents, while most of the applications for trademarks and utility models are initiated by residents. Figure 9 shows patents by sector and by the resident vs non-resident classification. Most of the patent (both resident and non-resident) belong to the chemical and mechanical engineering sectors.

Figure 7: Evolution of Patents Applications in Chile



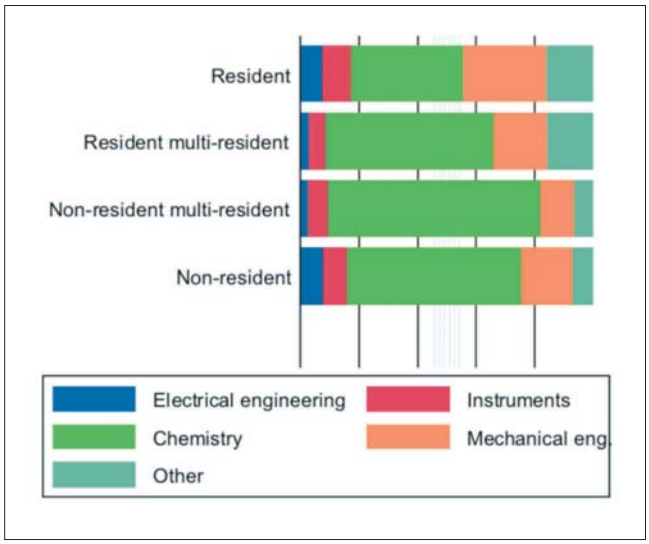
Source: Authors' own elaboration based on data from National Institute of Intellectual Property (INAPI), Ministry of Economy, Development and Tourism of Chile

Figure 8: Evolution of Patents Applications, Utility Models, Designs and Trademarks in Chile: Resident vs Non Resident



Source: Abud et al. (2013)

Figure 9: Patents Applications by sector: Resident vs Non Resident.



Source: Abud et al. (2013)

Regarding annual licensing agreements, in Chile, there is the option for residents and foreigners to register every licensing agreement with the National Institute of Intellectual Property (INAPI). Registering the agreement provides the parties involved with some advantages if they have legal problems with a third party. The records consists of simple statements in which the parties and the subject matter are reported, without disclosing the total content of the contract or the price of the transaction. In 2016, only 7% of the total marginal registration requests received by Inapi corresponded to licenses. Despite this low number, evidence has shown that more established licensing agreements exist in Chile than just the ones registered. In particular, Reyes and Teresa, in a thesis published in 2008, ran a survey of the patents holders, asking them if they have licensed the technology. They found that while, in 2007, there were just 14 licensing agreements registered, 60 patents holders responded that they had licensed their technology. This method of giving only general information regarding these contracts is common even in countries in which Markets for Technology are more developed.

Regarding the active number of patents and licenses, there is no official site where one can find this information. To the best of our knowledge, Reyes and Ripamonti (2008) use only an approximate number. Through their survey of patent holders, they estimate that the percentage of patents used in Chile are between the 58% and the 78% of the total patents and that the percentage of patents licensed is between 8% and 24%. Both estimates are within the same range as in developed countries.

Regarding the last indicator, annual licensing revenues, no study has tried to estimate this amount. This is due to the low number of licenses registered with the INAPI and the lack of interest in making the economic terms of these contracts public.

4. Conclusions

Researchers have always been interested on the relationship between innovation and the main economic indicators. Although it seems that there is a consensus regarding the positive effect of innovation on economic development, productivity and employment, it is quite difficult to analyze the relationship because innovation is measured by using only an input measure: R&D expenditures. In this paper, we summarize output indicators to proxy innovation, and we analyze them in the context of Chile to understand how MFT are developed there. Regarding the input measure, we show that Chile has always presented a deficient amount of R&D expenditures. In fact, Chile R&D expenditures are half the average of the OCDE countries'. Regarding the output measures, Chile does not provide comprehensive or comparable information for all of them. In particular, we found information only on the number of annual patent applications and annual patent grants, available from INAPI, and these indicators are not very promising. In fact, most of the patent applications and patent grants have been initiated by non-residents. Regarding the annual licensing agreements, the active number of patents and licenses, and the annual licensing revenues, Chile has no official indicators and no official way to record these data. Therefore, we conclude that the Markets for Technology in Chile are not developed: we could find no indicators to prove otherwise, and the scarce official information available shows a serious national innovation deficit.

However, given the fast development of IA and the automatization era, as well as all the interesting challenges that are facing our societies, companies will need to manage innovation in an effective way in order to remain competitive in the product market. Even the more traditional companies will be forced to switch from innovating strictly through internal R&D to adopting an open approach that allows them to buy and sell technology in the Markets for Technology.

The extent of the Markets for Technology has dramatically increased in developed countries over the last decades, thus facilitating the diffusion of technological knowledge. Since licensing has been the most demanded option for transferring technology, most of the studies that quantify the development of MFT have focused on the aggregate quantity of royalties and fixed fees charged in the market. Therefore, Chile should consider ways to record the data needed to facilitate research and, of course, the diffusion of the innovative knowledge that will be necessary to remain competitive.

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Social Technology Enhancing the Town Centre Management Attractiveness

Federica Caboni[1], Roberto Bruni[2]*

Abstract: The article describes the social technology's role in the TCM attractiveness from the retailers' perspective. The exploratory research experience in Sweden during different periods between 2012 and 2016 includes contributions of the literature, direct interviews and analysis of the TCM's websites. The state-of-the-art of social commerce perception by managers and retailers is defined, and specific evidences are given through research. An interpretation of the concept of attractiveness of the TCM is presented to explain how social commerce could affect this property. Dissonance between opinions and statements of TCM stakeholders are discussed, and the will to use social commerce to increase opportunities for TCM is, in general, declared by retailers, but it is not realized in practice in management activities. A comparative empirical exploration between different countries could be conducted in future. This paper explores the actual situation in the use of website sustaining that the social commerce and the social networks are able to go beyond the supporting of commerce activity and they are able to support the TCM attractiveness and place attachment.

Keywords: Town Centre Management; social commerce; attractiveness; belonging

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Introduction

This work integrates the literature on marketing and management of places with a particular focus on Town Centre Management (TCM). The work is centred on the use of social technology to improve the relationships between stakeholders and the value offered by the place. A particular research focus is on the role of users, actors, and stakeholders with regards to their involvement in social network activities, and this study investigates—with literature and specific observation experiences—the perceived and effective role of social commerce in TCM activities. Different actors argue that the mix of hard and soft conditions is relevant in territorial development. In a place-marketing approach, Musterd and Murie (2010) state that within four relevant theoretical frameworks, relationships and hard and soft conditions are at the base of territorial development, and they assume that technology and innovation are between the relevant assets in territorial development. Different perspectives include research over technology, ICT, and innovation about places. Also, the open innovation in relation to the territory development is increasing in relevance (Baron *et al.* 2016), and SMART city projects (Shapiro, 2006; Caragliu *et al.* 2011; Chourabi *et al.* 2012) contributes different points of view and specializations. The research paths are addressed toward the study of relations between technology and human interactions that increase the quality of life through participation. Value-exchange technology becomes part of the place, and the concept of "connection" multiplies the opportunities and will to be part of the system of values. In that context, the Internet is a fundamental source of relationships and connections and could contribute to improving the quality of life in a city. Coca-Stefaniak (2014) and (Caboni and Bruni 2015) suggest to concentrate efforts on the study of relationships between TCM, new technologies, and social networks. Also, new research activities could contribute to increase the efforts in public-private activities, which merge different contributions between place stakeholders and the meaning behind the multiplicity of an organizational model. This work is focused on the scenario of a TCM and on the perspective of TCM attractiveness with respect to its stakeholders. The concept of attractiveness is now explained. In particular, there is a rule of "belonging" for a subject to be involved with a TCM as a property of stakeholders involved in TCM caused by the system of stimuli generated by offline (asset and driver of the place) and on line activities (the online sharing activity and the social web to express their opinion – the social commerce as stimulator of belonging). New challenges have affected town centre management. In particular, the development of new technologies through the Internet such as social media has improved visitor experiences by linking the virtual and physical world (Caboni and Bruni, 2015; Coca-Stefaniak, 2014). The development of social and innovation technologies (Coca-Stefaniak, 2014) give to customers new tools to manage their shopping activities and to increase their shopping experience as well as their relationship with the city. Today, the development of the Internet and social technology (e.g., social commerce) has changed and continues to change the behaviour of town centre retailers with regards to managing their activities (Rezaei and Ismail, 2014; Chang, 2012; Izquierdo-Yusta and Newell, 2011). These technologies can be used with planned initiatives to completely revitalize the town centre's vitality. Also, social media now puts enormous pressure on traditional retailers. In this scenario, it is important to understand in what way the use of social commerce is perceived by Town Centre retailers. Is it only a significant element to increase their single business or could it be useful to increase the town centre attractiveness and consequently attract new interest in this urban area? In the second stage of this study, we present an analysis of the multifaceted characteristics that compose social commerce, and we particularly emphasize how this can be applied to town centre permits to revitalize the town centre. The article is organized as follows. First, the theoretical background of the topic is discussed, and we present an overview of the social changes apparent

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within the city centres. Also, the TCM scheme and the social commerce in the context of the TCM are discussed. The work continues by outlining the methodology and the field analysis. The article ends by highlighting the role of social commerce in relation to the retailers and TCM with a special focus on the role of s-commerce and the sense of belonging to TCM.

Theoretical Background

A brief theoretical background is presented to identify new challenges have affected town centre management. In particular, the development of new technologies through the Internet such as social media has improved visitor experiences by linking the virtual and physical world (Caboni and Bruni, 2015; Coca-Stefaniak, 2014). The development of social technologies (Coca-Stefaniak, 2014) give to customers new tools to manage their shopping activities and to increase their shopping experience as well as their relationship with the city.

The social commerce: toward the TCM contextualization

Social commerce (s-commerce) is considered as a commerce activity developed through social media, such as Facebook, Twitter, or other platforms (Ickler *et al.,* 2009; Liang, *et al.,* 2011; Liang and Turban, 2011), where people have the possibility to share their purchases with other people that populate the virtual world; in this way, these technologies attempt to enhance shopping experiences in a shared online environment (Curty and Zhang, 2011). Several scholars defined s-commerce as a new form of Internet sales developed in the last ten years (Curty and Zhang, 2011; Roblek *et al.,* 2013). In 2005, Yahoo! introduced the concept of s-commerce (Jascanu *et al.,* 2007; Ickler, 2009; Wang, 2009; Wang and Zhang, 2012). Despite the rapid emergence of the s-commerce phenomenon (Shen, 2012), academic studies are still in early stages and scholars have only recently attempted to establish a standard definition of social commerce (Liang and Turban, 2011). By analysing more precisely the concept of social commerce, it is possible to identify a combination of social media and e-commerce. In this way, people have the possibility to purchase products or services and at the same time share information, experiences, and opinions with others (Liang *et al.,* 2011; Jascanu *et al.,* 2007; Wang, *et al.*, 2015). More broadly, s-commerce is an extension of e-commerce (Liang and Turban, 2011) through which both consumers and retailers can obtain several benefits. If e-commerce can be considered as a static form of selling where people (as consumers and sellers) can buy and sell without interaction with each other, s-commerce is a way to share something that creates a relationship not only between consumers and retailers (B2C) during the shopping process but, in general, between humans (H2H). This particular interaction stimulates relational opportunities around the simple transactional exchange and could contribute to the system of social interactions. The social commerce process is a system of activities and relations that act together through the transactional and relational activities that affect the interacting actors. Within social commerce, people have the possibility to identify the products that are more suitable for their needs or also to ask for help from the community and to interact with others (Kim and Srivastana, 2007). In this way, people became active producers of content over the Internet (Ickler *et al.,* 2009) and are no longer passive, as in the past. E-commerce integrated with s-commerce is useful in searching for products or information about products or sellers and *sharing* information, content, or recommendations through social media function is useful to interact with retailers and other involved actors. An s-commerce platform can be considered as a place where people can buy something with the intrinsic value related with the social aspect by which also the shopping process becomes social (Leitner and Grechening, 2007; Kim and Srivastava, 2007; Kang and Park, 2009; Shen, 2012). Social interaction has become the predominant element in the s-commerce process, and the creation of the relationship between people is now what drives the conversation: consumers are signalling the way that businesses must follow. People in general are increasingly familiarizing themselves with social media, and retailers within town centres cannot ignore this phenomenon. S-commerce, in its use of social media to permit people to share opinions, has changed the way people shop: "people have the power to share and make the world more open and connected" (Roblek *et al.,* 2013). The purchase activity completes the process, but it is not always necessary in value creation, and retailers can improve their profit by attracting and maintaining customers through recommendations (Curthy and Zhang, 2011). An s-commerce platform can be considered as a virtual small village where people communicate and share information about products, services, prices, deals, opinions, and experiences, write comments on goods and services, create a shopping list to share with friends or other customers, and build relationships with retailers (Leitner and Grechening, 2007), consumers, and other people interested in the town centre retail. All in all, town-centre retailers could integrate their marketing strategy in a social way by connecting e-commerce with social media tools to create new opportunities in stakeholder involvement.

Methodology

To achieve the purpose of this paper, different methods were used. First of all, as presented in the previous paragraph, a literature review (Rowley and Slack, 2004) on town centre management and s- commerce is presented in order to identify the state of research by integrating the research with meanings and applications of social technologies to the management of a town centre. Furthermore, a particular research focus is presented by the identification of the concept of "belonging" as one of the relevant components of the attractiveness of the TCM. Effective experiences regarding TCM in a Swedish context are presented, showing the state-of-the-art methodologies during the studied period regarding Town Centre Management retailers' perception of the use of social commerce. Afterward, the emerging results by the specific experiences are faced with the current state of Swedish TCMs' websites. This match permits us to study the correlation between the wish of social integration expressed during the years of field research and the social activities actually carried out by Swedish TCM and retailers. During 2012 and 2013, a participant observation (Spradley and McCurdy, 1980; Spradley, 2016) was conducted and key informants were interviewed (DeWalt and DeWalt, 2011) to investigate social commerce from retailers and TCM in Stockholm, Västerås, Malmö, and Göteborg. In particular, associations of TCM such as *City*

I Samverkan (the no-profit organization, the members are Stockholm city, property owners, trade, Stockholm public transport and the police as well as individual companies and organizations) and *Svenska Stadskärnor* (The Swedish Association of Town Centre Management) were selected. These research activities was repeated for a second time in 2015 and 2016 in order to verify eventual differences, and for a second time, the outcomes were correlated with the emergent results coming from the analysis of the TCM's website. Finally, from merging the literature and field experiences, an interpretation on the role of social commerce within the TCM attractiveness is presented.

The analysis in Swedish context

The reasons for choosing to analyse the Swedish context is twofold. The first reason is related to a period of visiting research at the Stockholm University, School of Business, within the Stockholm Programme of Place Branding. During this period, it was possible to create work relationships between the researcher and several TCM organizations and retailers in the major cities of Sweden, which was useful to conduct this research. The second reason is related to the high technology development in Sweden. This country is considered a global leader of innovation with a highly skilled labour force, sophisticated consumers, smooth business procedures, openness to international ownership, and a stable economy. More precisely, the *European Innovation Scoreboard*, an index published by the European Commission, in 2010 ranked Sweden as the leading country for innovation among EU member states. Reasons for this include a historic tradition of inventors, a commitment to gender equality, and a strong belief in the individual. In the 2016 the EU Commission released the *Summary Innovation Index*, which is a composite indicator based on the average innovation performance., Sweden is among the *Innovation Leaders* with innovation performance well above that of the EU average. Another element that guided the decision to use a Swedish context is related to the fact that Sweden has 10 million inhabitants, and 86% of these live within cities. A report (*E-commerce in the Nordics Six-month report 2016 By Postnord*) of online commerce in Nordic countries stated that six out of ten people in Nordic countries shopped online in the first six months of 2016. But, it was especially interesting that the largest percentage of online shoppers live in Sweden, where e-commerce has reached a significant level of maturity in relation of operators, competitors, infrastructure, and logistics. More precisely, in the first six months of 2016 in Sweden, 4.542.000 consumers shopped online. The selection of cities is related to the dimension of these places. In particular, the highest percentage of Sweden population live in Stockholm, the capital, as well as in Göteborg (the second largest city in Sweden located in the West) and in Malmö (the third largest city located in the south of Sweden). Therefore, these regions were selected as being the most important zones of Sweden in relation to population and business retail activities. The city of Västerås was selected for intense activity in the revitalization of the town centre process. The principal organization of TCM in Sweden originated there, and this guided the development of the Swedish town centre. The Swedish Association of Town Centre Management (*Svenska Stadskärnor*), founded in 1993, is a national association with 140 member organizations from both public and private sectors, such as local communities, town centre management organisations, property owners, retailers, architects, and national public authorities. The principal activities aim to exchange experiences of town centre management and town centre development, including coordinating conferences, seminars, and study tours and initiating studies and taking part in the official debates in the field of town centres.

Results

From the analysis of the context, it is apparent that town centre management was developed in order to face challenges within a town centre, and one of the principal goals is to address the cooperation among all people that work and live within the town centre. In particular, the observation and informal interviews conducted within a Swedish town centre showed that most retailers and managers work together to increase the town centre attractiveness in order to combine out-of-town shopping with a dynamic inner city. Offering an attractive environment for shopping with a pleasant, compact shopping area is one of the most difficult challenges. Moreover, Town centre management is aware of the need to implement social technologies to engage all active parts within the town centre. But, there has not yet been any implementation of a social platform that is able to create a virtual place where people can share information, products, services, and experiences. This important insight was integrated with the analysis of the Town centre website in order to verify whether there is a connection with social media and integration with online commerce. Inside the website analysed, there is a connection with the principal social media (*Facebook, Twitter, and Istangram*), but there is not a connection with several forms of online commerce (Table 1). In particular, what emerged from the website analysis is that the content shared within social media are introduced by the management of the town centre with very less interactions with people. So, the social media are only used to post something related to events. There are much less posts related to shopping and retail activities that are shared within social media. In particular, only on the *Västerås* Citysamverkan website is there a specific part that identifies all retailers placed within the town centre. Within Stockhom *City I Samverkan*, there is a specific retail guide that identifies the principal zone of shopping not only in Stockholm but also in Gothenburg and Malmo, but there is no specific focus about retailers present within the town centre.

Town Centre/ TCM schemes	Internet		Social Media			Online commerce	
	Website	Retail focus	Facebook	Twitter	Instagram	e-commerce	s-commerce
Västerås Citysamverkan	✓	✓	✓	✓	✓	-	-
Stockholm i Samverkan	✓	✓	✓	✓	-	-	-
Svenska Stadskärnor	✓	-	✓	✓	-	-	-
Göteborg	✓	-	✓	✓	✓	-	-
Malmö	✓	-	✓	✓	✓	-	-

Source. Authors' elaboration

Discussion

Literature and practical experiences focused on participant observation help to speculate on the role of s-commerce within TCM activity and, in particular, within the TCM attractiveness. Empirical and quantitative studies could explain relations and correlations between agents and interactive factors between TCM and different stakeholders, and the following qualitative approach represents a contribution to express the system of components of attractiveness about the TCM in relation to the social commerce nature, focusing on the stimulation of the sense of "belonging" as its main component of attractiveness of TCM's demand—that is, *customers of retailers, visitors, investors, stakeholders*.

Social commerce and retailers

Through the use of social networking platforms, online purchases are the only formal conclusion of a long process of socialization, communication, and exchange of information that goes beyond the single purchase. S-commerce is for retailers a system of auto-generated services that allow retailers to improve (or destroy) the whole reputation of the store, the positioning of the value offers that increase (or reduce) the distances between customers. Through this kind of online commerce, consumers can conduct a transaction directly with sellers without having contact with the physical store (Terzi, 2011); this occurs after the exchange of information with the retailer. Sometimes, the community could contribute to increasing the shopping experience by giving advice about products and services and, in some platforms, giving grades and evaluations about the services, providing information regarding the relationships with the retailer, quality of the product, and suggestions about new products. For the single retailer, social commerce is able to increase the opportunity, as stated by e-commerce in the past, and could contribute to building positioning of a retail offering, to increase the affection in the store brand and, sometimes, for the physical store. In that case, the affection in the store is generated by the social relationships between store employees and community involved in the social e-commerce. The online dialogue and the stimulated relationship could continue off line.

Social commerce and sales within the TCM

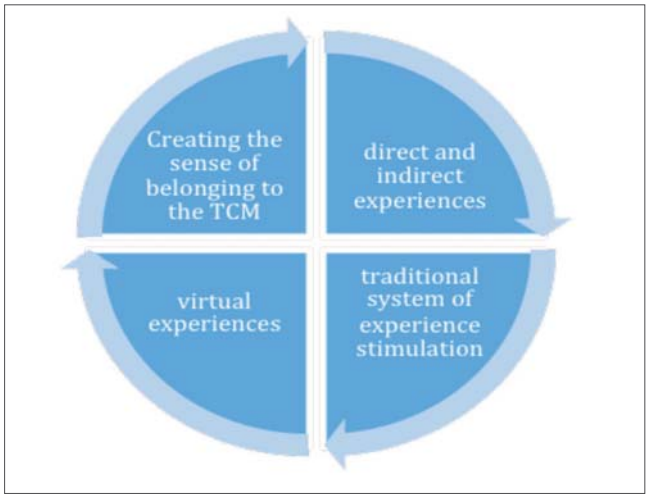
Considering the TCM experience, social commerce is functional for retailers included in the TCM area, but at the same time, it is useful in particular for retailers who are able to use the tool to establish relationships with the virtual community that follows a path of relationship "materialization" with the real world (i.e., *retail offering*) of the TCM that represent a system of place offering, including the retail offering. The TCM presents strengths based on the system of offering made by public and private partnerships that include different territory stakeholders – *retailers included* – and for this reason, it is difficult to generate an increase of sales caused by the variety of the offering; probably, the s-commerce related to the TCM loses relevance in turnover increasing for the single retailer and assumes new opportunities and perspectives. The meaning behind social commerce, within the theoretical background expressed, could affect new collective lines, representing, for instance, a virtual "outlet centre" in which it is possible to provide offerings out of markets, discounts, sales, and special prices. The new collections and services could then be distributed directly in store; at the same time, social commerce could server several purposes, such as solidarity or communication—for example, collecting the contributions of associated retailers in an e-commerce site that sells products and services for a variety of non-profit economic activities with the goal to increase town centre popularity. It could likewise be used to sell rare, antique, or precious products to users who are physically very distant from downtown streets. That strategy could stimulate discussion, word of mouth, and curiosity for a place offering and could be useful both for TCM (i.e., increasing the number of visitors) and for the single retailers because of the reduction of inventories that increase sales and improve the opportunity to obtain sales directly in the store.

Social commerce and TCM attractiveness

Less is known about the attractiveness of the whole TCM system; in general, the attractiveness is studied from a place-marketing perspective, following the demand-driven view (Kotler, 1993; Gertner, 2011). In this work, a supply-driven view of attractiveness is proposed,

following the principles that regulates the place-branding activities (Kavaratis *et al.* 2015; Gertner, 2011); this is due to the necessity to use social commerce to stimulate town centre management positioning and, in particular, the sense of belonging by the demand side (i.e., customers, visitors and different TCM stakeholders). Different points of view are able to represent a multiplicity of processes that affect attractiveness. A correlation between attractiveness and TCM is presented below, and the perception by the users side is represented by a mix of stimuli that come from the town centre value proposition. The capability to attract stakeholders could both be the result of a marketing strategy or the effects of the place image (Govers *et al.* 2009), and for this reason, the attractiveness is linked with the sense of belonging and with the experiences of the subjects that interact with the TCM organization. Many authors study the role of experience in the city centre and, in particular, within TCMs (Hart *et al.,* 2013); it is possible to assume that the attractiveness in the TCM could be represented by the result of a system of stimuli and perceptions of the subject involved based on experiences and sense of belonging.

Figure 1. *System of experiences and sense of belonging representing the attractiveness in the TCM*



Source: Authors' elaboration

In a simplification of the mix of experiences and sensations that define attractiveness (see Figure 1), it is possible to represent the direct and indirect – *real and virtual* – experiences and the sense of belonging that could be interests the users side.

-Direct and indirect experiences. These represent the experienced visits, life experiences, and impressions within the TCM area. The indirect experiences come from the system of indirect stimuli made by perceptions of the third parties' experiences, i.e., tales, movies, word of mouth, travel experiences;

-Traditional system of experience stimulation. In this category, it is possible to consider the system of experiences that emerge by the place organization and by the organized offering of the place, improved eventually by the communication plans and particular events;

-Virtual experiences. This includes stimulating experiences by virtual tours using advanced technology online, webinars, videos, online reputation that in particular are able to directly involve the single subject interested in the town centre experience.

-Creating the sense of belonging to the TCM. Many opportunities are able to create the sense of belonging—for instance, participation in TCM activities; it is possible to consider the direct experiences to stimulate the sense of belonging as well as the indirect (or online) experience. In particular, the first are experienced directly within the TCM area, while the second need to be supported by the virtual community and, in this case, by social network activity. In particular, social commerce could be an opportunity to share opinions and advices between members of the same TCM website.

Social commerce represents a technological opportunity that is able to integrate and merge the concept of e-commerce with social network relationships that come from the website. By looking for the nature of the TCM, it is possible to argue that the purpose of this advanced method goes beyond the mere action to sell the integrated offering of the retailers involved in the TCM. First of all, the TCM goal is not only sales optimization of aggregated retailers, but as the literature sustains, the whole TCM has the aim to revitalize the city centre. For this reason, the function of sales inside a social commerce website could represent a secondary activity—a marginal function that stimulates the contacts between the interested subjects to the website. The resources and information exchange – for example, between the public and private government sharing projects, opportunities, revitalization activities, events design and management, comments, point of views, feedbacks about the tenant mix of the retailers, and the communication of opportunities – about the TCM in an open platform are relevant. Open platform sharing permits the actors – public, private, citizens, visitors, and a multiplicity of stakeholders as well – to express opinions and present points of view, insights, and ideas inside and around the TCM organization. It is possible to assume that social commerce in TCM could substitute classical social network pages because in the classical social network pages, the resources exchange is focused only on information exchange; in social commerce websites, e-commerce and social activities are interactive, and for this reason, they are able to be one part of the other and link different goals and multiplicity of strengths. By linking experiences with literature contributions, particular relations emerge by the contacts between users and social commerce websites within the TCM. The s-commerce process develops in three stages of shopping (i.e., social, e-commerce, purchase). The s-commerce framework gives different results and perceptions to the user depending on the relevance attributed to the three stages of shopping. Regarding the three stages of s-commerce, it is possible to argue that users interested by the purchase activity probably presents a first interest to the single product/service purchase with a limited interest to the relationship with the supplier, community, and TCM activity. In that case, the interest in the purchase is the unique element that brings the user to frequent the website. Subjects interested in the e-commerce activity could be, in general, interested in the whole e-commerce activity of social

commerce, and the user could represent a stable customer who is interested by the whole e-commerce offering. They could also be, in part, stimulated by the social activity on the portal. A first link between the whole TCM offering is possible. It is possible to consider the interest in value offering of the s-commerce activity in TCM realized by reliability, reputation, and positioning. The interest for the social activity is a signal of interest for the community of the TCM, and the sense of belonging is much more marked. In that case, a system of elements is emerging and the exchange of resources, loyalty, and information emerge. In that case, the subject could be interested by the system of relationships and value perceived because the relational level is up to the utility function of the web site. It is possible to assume that users are interested in the value co-creation, participation, and belonging to the value proposition. In the table below the relation between the three stages of s-commerce and involvement of the user.

Table n. 2. Relation between three stages of s-commerce and user involvement

The three stages of s-commerce order	Approach by demand side
Purchase – e-commerce - sharing	Interested by the product/service purchase
E-commerce – purchase - sharing	Interested by the value offering (reliability, reputation, positioning)
Sharing – e- commerce - purchase	Interested by the value co-creation, participation, and belonging to the value proposition

Source: Authors' elaboration

Conclusions

The role of social commerce in TCM depends on different factors, including the positioning of the TCM, the value offering online and offline, the value in use of the website, and the perceptions of the users involved in the value offering. The result that comes from the s-commerce activity is always the synthesis of a multiplicity of stimuli that only partially is possible to regulate. Sure, the effects of a s-commerce strategy applied to the TCM is always a system of results that integrates both online and off-line activities. An s-commerce platform is a functional tool that represents an opportunity to manage the real life of the TCM; this is its first goal. The contents of the social activity need to be generated by the vivacity of the real community, and the on-line commerce opportunities are linked with a systematic activity of retailers' value propositions that cannot be, simply, the collection of individual value propositions. For this reason, each retailer or stakeholder interested in TCM s-commerce must be connected in the whole TCM strategy. This is because real people are behind the technologies, and for this reason, it is possible to be part of (or to belong to) the systems made by people. The Swedish field experiences and data represent a situation that has not changed in the past years. The observations present interest in e-commerce and s-commerce use by retailers but, anyhow, no investments in this field are in evidence. An analysis of Swedish websites unveiled that there is no implementation of a social platform that seeks to increase the attractiveness of a town centre. In particular, retailers have created their own websites (or a Facebook page) to communicate with their customers. But, there is currently no cooperation with TCM to create a TCM social platform. It is possible to argue that large difficulties associated with time and economic resources emerged, including management of online and offline activities, standardization of information systems, and shared marketing strategies. Generally, in the medium and long run, the public-private partnership (with regards to TCM) is centered on offline activities; the different cases underline the difficulties of partnerships and, in particular, public-private partnerships. Online activities are considered as a residual stuff, though in TCM activities, different actors elevate its relevance. Sometimes, online activities are used in communication and information, while e-commerce activities are singularly developed by each retailer in specific and individual websites and are not considered as a systemic opportunity on the TCM website. A triple change of paradigm emerges by different sides, including TCM management and demand (including visitors and consumers in TCM). The retailers believe new opportunities could come from the s-commerce approach to the TCM. In any case, the s-commerce activity could increase the TCM and single retailer awareness because of the exchange of relationships between the different actors in the system. From the TCM management side, the relevance of s-commerce is represented by different opportunities, including consolidation of the positioning in relation to the TCM activities. From the demand side, the implementation of an s-commerce platform could be useful to increase confidence and sense of belonging with the TCM's philosophy, the demand, and different stakeholders. In particular, through a social commerce platform, people within the town centre have the possibility to try new kinds of experiences and to become an active protagonist in the creation of the strategy and actions of TCM. In this way, TCM could become a social community where people (i.e., citizens, tourists, investors, public and private entities) have the possibility to share any kind of experience and be involved in the administration of the Town Centre in order to increase the attractiveness of the place. Further studies could specifically research the relationships between s-commerce and developing opportunities in TCM. In particular, future studies should research possible improvements to managing positioning and boosting a sense of belonging as well as determining online and offline effects.

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El *S-commerce*: La innovación a través de Medios Sociales

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Resumen: La sociedad de la información ha favorecido la adopción del *e-commerce* como un mecanismo para ampliar los mercados, considerando las preferencias de las comunidades, donde los medios sociales son potentes herramientas que permiten el éxito en las transacciones a través del *s-commerce*. El estudio es descriptivo y se realizó a empresarios (N=287) del sector calzado en Bucaramanga (Santander-Colombia) para determinar su percepción sobre el uso de los medios sociales como estrategia de comercialización. Se destaca la utilización de Facebook, Instagram, YouTube y Twitter como los más aceptados por sus propiedades de conexión, y, Taobao, E-bay, Amazon, Linio y Mercado Libre, como canales oficiales de comercialización. Finalmente, se proponen estrategias para adoptar las TIC para incrementar la competitividad en las organizaciones.

Palabras clave: TIC; s-commerce; competitividad; sector calzado; medios sociales; e-commerce.

Abstract: The information society has favored the adoption of e-commerce as a mechanism to expand markets, considering the preferences of communities, where social media are powerful tools that allow success in transactions through Of the s-commerce. The study is descriptive and was carried out to entrepreneurs (N = 287) of the footwear sector in Bucaramanga (Santander-Colombia) to determine their perception about the use of social media as a marketing strategy. It highlights the use of Facebook, Instagram, YouTube and Twitter as the most accepted by its connection properties, and, Taobao, E-bay, Amazon, Linio and Mercado Libre, as official channels of marketing. Finally, strategies are proposed to adopt ICT to increase competitiveness in organizations.

Keywords: ICT; s-commerce; competitiveness; footwear sector; social media tools; e-commerce.

Introduction

El incremento de la tecnología ha permitido el desarrollo de la comunicación entre las organizaciones y las comunidades a través del uso de las Tecnologías de la Información y las Comunicaciones (TIC) favoreciendo el éxito en las transacciones (Guzmán, 2013). El *e-commerce* se ha convertido en un modelo a seguir para las organizaciones, considerando que la tendencia mundial obedece a la adopción de las TIC, como un elemento favorecedor de las dinámicas comunicativas y un mecanismo de innovación social (Maiolini, Marra, Baldassarri & Carlei, 2016) que ha acercado a las organizaciones y a los consumidores (Webb, Gibson & Forkosh, 2013).

Precisamente, los medios sociales de internet son una herramienta que favorece la interacción entre los usuarios, convirtiéndose en un mecanismo que permite a las organizaciones llegar de manera más directa a sus clientes debido a la confianza que tienen sobre la marca (Jiang, Tadikamalla, Shang & Zhao, 2016). En este sentido, el *s-commerce* es una estrategia que crea un acercamiento entre el cliente final y la empresa disminuyendo los intermediarios a partir del uso de las TIC (Cui, Pan, Newell & Cui, 2017). Sin embargo, los medios sociales son considerados como herramientas de ocio, dado que las redes sociales han facilitado la publicación de un sin número de información en ocasiones poco fundamentada, dada su fácil comunicación y manejo (Guzmán & Del Moral, 2014).

Maiolini, Marra, Baldassarri y Carlei (2016) afirman que las pequeñas, medianas empresas y las *start-up* pueden utilizar las TIC para favorecer sus procesos de una manera innovadora, debido a que estas tecnologías trazan el futuro de las organizaciones en la globalización de las industrias. Este artículo es producto de una investigación realizada en la Universidad Autónoma de Bucaramanga (Colombia) donde se buscó cómo aportar desde la academia a la mejora en los procesos comerciales del sector calzado con el uso de las herramientas sociales de internet para favorecer la apertura de nuevos mercados y el incremento de transacciones efectivas, detectándose el uso de los medios sociales -Facebook, Instagram, YouTube y Twitter- como canales informales de venta y los sitios -Taobao, E-bay, Amazon, Linio y Mercado Libre- como los canales formales establecidos para llegar al público objetivo.

La Web Social y el *e-commerce*

Es evidente que las TIC favorecen la comercialización de productos y servicios en una organización, donde el trabajo colaborativo dentro de la empresa y las transacciones entre las comunidades permite el incremento de las ventas en las organizaciones con la utilización de canales de comunicación basados en web social y diferentes plataformas, dispositivos móviles, marketing y *e-commerce* (Maiolini, Marra, Baldassarri & Carlei, 2016). Esto se ha dado precisamente, porque los procesos de comunicación con el uso de internet han permitido su evolución para llegar al cliente final favoreciendo la competitividad de las organizaciones porque no hay intermediarios (Yan, Zheng, Wang, Song & Zhang, 2015), debido a la facilidad que ofrece la web social para que los usuarios puedan expresar sus ideas creativas respaldadas por la comunidad permitiendo que la empresa adapte sus productos y/o servicios considerando sus preferencias (Fernandes & Belo, 2016).

Diversos autores afirman que el *e-commerce* ofrece diferentes beneficios para las empresas. Erazo, Castro y Achicanoy (2016) aseguran que reduce los costos que se generan en los procesos organizacionales,

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promoviendo la apertura de nuevos mercados y mejorando la atención de clientes nuevos y antiguos. Guzmán (2013) afirma que facilita el acceso de la empresa de una manera directa con los clientes favoreciendo la compra y evitando la presencialidad, incluyendo a las comunidades de todo el mundo. Hu, Huang, Zhong, Davison y Zhao (2016) indican que permite la optimización de los procesos, porque actúa en función del consumidor atendiendo sus deseos, casi personalizados y eliminando los intermediarios. Similar a como lo abordan Yapar, Bayrakdar y Yapar (2015) porque se facilita la comercialización casi mundial. Rahayu y Day (2015) confirman que las economías en vías de desarrollo pueden adoptar más fácil al *e-commerce* puesto que la inversión para su incursión es muy baja. Torres y Arroyo (2016) mencionan que su adopción surge como estrategia comercial para la mejora de la reputación de las organizaciones en el mercado, reduciendo de forma abrumadora la asimetría de la información e incrementando la aceptación de los productos o servicios.

Un aspecto importante a considerar en el *e-commerce* es la seguridad y la confiabilidad que requiere el usuario que compra por internet (Huang & Benyoucef, 2017; Jiang, Tadikamalla, Shang & Zhao, 2016). En este sentido, existen diferentes razones que han evitado la implementación del *e-commerce* en las organizaciones. Erazo, Castro y Achicanoy (2016) y Nilashi, Ibrahim, Mirabi, Ebrahimi y Zare (2015) indican que se trata de la desconfianza en la transacción y los costos que no se clarifican en el momento de la compra. Gomez, Martens y Turlea (2014) mencionan que los costos pueden verse incrementados porque la comunicación entre el consumidor y el vendedor no es clara, debido a diferencias lingüísticas, culturales, institucionales y comerciales. Savrul, Incekara y Sener (2014) precisan que la informalidad de quienes ofrecen el producto o servicio, influye en que el consumidor vea limitaciones relacionadas con la infraestructura y la seguridad para garantizar la transacción. Kurnia, Choudrie, Mahbubur y Alzougool (2015) aseguran que la implementación del *e-commerce* ha sido lenta porque en los países en vías de desarrollo, debido a las condiciones sociales, económicas, tecnológicas y políticas, aun cuando hay una mayor apropiación de este tipo de transacciones. Yapar, Bayrakdar y Yapar (2015) indican que la mayor falencia para adoptar esta estrategia es la incertidumbre en el tema tributario.

De otro lado, Torres y Arroyo (2016) afirman que el *e-commerce* ha superado las expectativas de rendimiento y de esfuerzo que esperaban los empresarios, así como la influencia social que la falta de claridad en el establecimiento de unas condiciones que faciliten su adopción, y el hábito de los consumidores hacia los precios bajos, la calidad, la confianza, la seguridad y la privacidad percibida, pese al riesgo que se considera se puede dar por la orientación hacia la innovación. Para contrarrestar esta problemática, Cui, Pan, Newell y Cui (2017) aseguran que se requiere esclarecer la naturaleza de la actividad que se desarrolla y el entorno de la organización, pues previamente las organizaciones que implementan el *e-commerce* requieren: gestionar sus capacidades, de acuerdo a sus recursos, gestionar su estructura y estrategias para fortalecer las capacidades que ya poseen y manejar los recursos para el desarrollo de las capacidades dinámicas que faciliten el éxito en la transacción.

El comercio a través de internet o *e-commerce* facilita la comercialización para las empresas a través de plataformas tecnológicas (Webb, Gibson & Forkosh, 2013), diferenciándose con los canales tradicionales por la forma en que se desarrolla actualmente (Guzmán & Del Moral, 2014). Permite la colaboración online entre los sujetos que intervienen en la transacción utilizando las TIC (Turban, Bolloju & Liang, 2011), y proveen un entorno social que favorece la conversación participativa de los usuarios (Huang & Benyoucef, 2017). De hecho, el *e-commerce* tiene tres elementos fundamentales: el uso de las tecnologías sociales, la interacción entre los usuarios y las comunidades y las actividades comerciales cerradas por una transacción (Turban, Bolloju & Liang, 2011). Según el *Top Sites Alexa* (2017), los canales de venta de *e-commerce* más populares son Taobao, Amazon, E-bay, Olx, Mercadolibre, Tmail y Aliexpress.

Además, es necesario indicar que la evolución del *e-commerce* evidencia un avance hacia el *s-commerce* relacionando a las organizaciones de manera directa con los clientes finales disminuyendo los intermediarios y facilitando para el cliente la casi personalización de sus productos (Yan, Zheng, Wang, Song & Zhang, 2015), utilizando como estrategia a los medios sociales, para avanzar hasta el *s-commerce* (Wu, Shen & Chang, 2015). Las diferencias entre el *e-commerce* y el *s-commerce* radican principalmente en la forma como se comunican las empresas con sus consumidores y se orientan hacia la personalización (Huang & Benyoucef, 2017), a ofrecer relaciones dinámicas (Yan, Zheng, Wang, Song & Zhang, 2015), a la creación de contenidos conjuntos (Hajli & Sims, 2015) y a la interacción entre las partes (Bai, Yao & Dou, 2015) para cerrar una transacción (Wu, Shen & Chang, 2015).

De las redes sociales al *s-commerce*

Los medios sociales en internet o herramientas que facilitan el *s-commerce* permiten la interacción entre los usuarios permitiendo el cierre de la transacción, aportando al desarrollo del comercio social (Bai, Yao & Dou, 2015; Huang & Benyoucef, 2017) a partir de las conversaciones online que favorecen la personalización de servicios para las comunidades (Huang & Benyoucef, 2017), creando contenido colaborativo y agregando valor para el consumidor (Hajli & Sims, 2015) siendo dinámicos y favoreciendo la reputación de la marca (Yan, Zheng, Wang, Song & Zhang, 2015).

Existen diferentes definiciones de *s-commerce*. Wu, Shen y Chang (2015) indican que es el medio que combina a la tecnología de la web social con la satisfacción del consumidor evidenciada a través de una comunidad. Lin, Li y Wang (2017) aseguran que es una estrategia que permite a los empresarios, el manejo de sus negocios involucrando actividades comerciales relacionadas con el uso de herramientas de los medios sociales o de la web 2.0 que se orienta hacia los consumidores. Jacobsen y Barnes (2017) mencionan que es el sitio de intersección entre los sitios de comercio electrónico y las redes sociales para facilitar una transacción. Hwang y Kim (2016) afirman que es un subconjunto del *e-commerce* que utiliza las redes sociales para favorecer las interacciones con los usuarios. Ali y Busalim (2017) señalan que es una integración de las actividades que se generan alrededor de

una transacción de manera social, donde los usuarios pueden difundir boca-a-boca sus experiencias de compra, conocimientos sobre los productos y proporcionar información sobre productos y servicios, a su red de contactos. Precisamente, Fernandes y Belo (2016) clasifican el uso de las redes sociales en: buscar conocimiento, interactuar con los clientes, lanzar nuevos productos, y, la comercialización de productos y servicios.

Un estudio realizado con las empresas de Algarve (Portugal) permitió determinar que las redes sociales ofrecen un potencial para la contratación de proyectos empresariales porque permiten acceder a un mayor número de opciones para los profesionales, interactuar con los clientes, lanzar nuevos productos y comercializarlos (Fernandes & Belo, 2016).

De otro lado, la facilidad de las redes sociales como mecanismos de comunicación, ha facilitado la interacción entre las empresas y los usuarios, pues convocan usuarios con temas afines (Guzmán, 2013; Webb, Gibson & Forkosh, 2013). Estos medios sociales son favorecedores de la innovación social porque permiten que las organizaciones se acerquen al consumidor de manera más directa. En una investigación realizada en China, se detectó que a través del *e-commerce* se facilitó la comercialización de los productos de los aldeanos del sector rural (Cui, Pan, Newell & Cui, 2017), utilizando las herramientas del *s-commerce*.

Por otra parte, son diversos los propósitos de una estrategia basada *en s-commerce*. Pelc (2017) afirma que la interactividad que ofrecen las redes sociales permite la utilización de aplicaciones que favorezcan la difusión de las innovaciones de las organizaciones como una forma de mejorar los procesos comerciales. La Tabla 1 muestra algunos estudios realizados para precisar cuáles son las utilidades de los medios sociales para las organizaciones en el ámbito empresarial:

Tabla 1. Investigaciones realizadas para determinar la utilidad de los medios sociales a las empresas. Elaboración propia.

Investigación realizada	Medios sociales	Propósito	Autores
519 universidades	Twitter y YouTube	Apoyar la investigación y la generación de conocimiento.	Guzmán (2013)
	YouTube	Generar valor para la marca de la empresa y la necesidad del community manager.	Guzmán & Del Moral (2014)
Estadísticas de popularidad	Facebook, Twitter, YouTube, Google+ y LinkedIn	Promover nuevas fuentes de innovación para las empresas.	Pelc (2017)
230 usuarios y 70 empresas	Facebook	Favorecer la interacción con los clientes, y permitir el lanzamiento de nuevos.	Fernandes & Belo (2016)
	Orkut, LinkedIn y Wikis	Apoyar la estrategia del marketing.	Fernandes & Belo (2016)
421 usuarios	Facebook, Twitter y Pinterest	Determinar los motivos de compra de los consumidores.	Jacobsen & Barnes (2017)
134 usuarios	Facebook, LinkedIn y Twitter	Favorecer la confianza del consumidor por el respaldo de la comunidad.	Lee, Cho & Bae (2017)

Asimismo, las redes sociales han avanzado hasta su masificación considerando el incremento de su número de seguidores. De hecho, las herramientas sociales que hacen parte del *s-commerce* son: las redes sociales, los blogs, los foros, y las recomendaciones (Hajli & Sims, 2015), los micro-blogs, las wikis, las plataformas de *e-commerce* y YouTube (Guzmán & Del Moral, 2014), y, Flickr y las comunidades online (Bai, Yao & Dou, 2015; Huang & Benyoucef, 2017). La Tabla 2 evidencia el nivel de adopción de las primeras cinco herramientas de los medios sociales según el *Top sites Alexa* (2017) que mide el tráfico en las web de manera diaria –Facebook, YouTube, Wikipedia, Amazon y Twitter- donde *el número de sitios vinculados* se calcula con base en el número total de enlaces al sitio, *el porcentaje de tráfico* a través de las referencias que provienen de los motores de búsqueda, *el tiempo en el sitio* a partir del estimado diario en minutos y segundos por visitantes, y *las páginas vistas* con respecto a las páginas diarias únicas por visitante.

Tabla 2. Distribución de las herramientas de medición del *Top sites Alexa* para determinar la popularidad de los medios sociales. Elaboración propia.

Medio social	Sitios enlazados	% de tráfico	Tiempo en el sitio	Páginas vistas
Facebook	7,601,185	8.40%	9:48	4.02
YouTube	2,699,220	15.50%	8:24	4.94
Wikipedia	1,722,890	68.30%	4:11	3.27
Amazon	827,984	21.70%	8:05	8.48
Twitter	5,571,981	12.10%	6:13	3.27

Se observa que Facebook tiene mayor *número de sitios enlazados* para facilitar el cierre de una transacción entre los usuarios, mientras que el mayor *porcentaje de tráfico* se encuentra en Wikipedia, el mayor *número de páginas vistas* en Amazon y el *tiempo en el sitio* es mayor en Facebook, YouTube y Amazon.

Lin, Li y Wang (2017) afirman que el uso de las herramientas del social media, interactuando con los sitios de *e-commerce* e incrementando su uso como canal de comercialización facilitan la adopción del *s-commerce*, donde Hwang y Kim (2016) aseveran que se requiere recrear un ambiente para la transacción confiable y basado en la seguridad que debe ofrecer la empresa a los clientes, y considerando los diferentes hábitos del cliente, mientras que Lee, Cho y Bae (2017) confirman que el cierre de la transacción impacta en el nivel de confianza que tiene el cliente con la empresa.

El *s-commerce* tiene tres orientaciones: *a)hacia las organizaciones*, considerando la reputación, la reputación de la empresa y el uso generalizado sobre contenido social; *b) hacia la publicidad*, a través de la investigación que se realiza en el tema, el uso del comercio móvil y la publicidad generada; *c) hacia el boca-a-boca*, revisiones de los medios sociales, interacción con los usuarios de la red, cultura, confianza generados y la adopción del marketing viral (Lin, Li & Wang, 2017).

Metodos

Participantes

El estudio realizado es cuantitativo y buscó medir la percepción de 267 empresarios del subsector calzado de Bucaramanga (Santander-Colombia) para determinar sus apreciaciones sobre el teletrabajo y la implementación del *s-commerce* como estrategia para la comercialización de sus productos y fue realizada en mayo de 2016. La antigüedad de estas empresas se encuentra "entre 3-5 años" el 28.2%, "entre 5-10 años" el 25.4%, "entre 1-3 años" el 20.2%, "entre 10-20 años" el 13.2%, "más de 20 años" el 7.0% "menos de 1 año" el 5.9%. De otro lado, el 64.4% afirmó que tiene solo una sede, el 24.3% que tiene 2, y el resto 11.3% tiene "entre 3-5 sedes". Las empresas tienen contratados "entre 1-10 empleados" el 72.5%, "entre 10-20" el 18.1%, "entre 20-40" el 5.9%, y tan solo el 3.5% tienen "más de 40 empleados". Entretanto, la formación de los empresarios se orienta hacia la educación media el 59.4%, tecnologías el 19.6%, universitarios el 14.3%, nivel básico el 5.9%, y tan solo el 0.3% tiene nivel de posgrado.

Instrumento de medición

El instrumento para la recolección de datos fue digital y se compuso por cinco secciones, cuatro de ellas relacionadas con este artículo: *a) elementos descriptivos de la organización*: edad, número de empleados, sedes, nivel educativo del empresario*; b) percepción sobre la utilización del e-commerce*: los productos que ofrece la empresa al público a través de imágenes; características, funcionalidades y/o precios de los productos para fomentar las ventas a través de modalidades tradicionales de venta; vender los productos a través de portales web de comercio electrónico; vender los productos a través de una plataforma electrónica desarrollada y gestionada por la organización; incrementar el número de clientes en el exterior para diversificar las ventas; conozco en qué consiste el *e-commerce* y entiendo los beneficios que puede aportar a la organización; el personal calificado es el apropiado para el desarrollo del *e-commerce*; es importante implementarlo, pero no se sabe por dónde iniciar; el conocimiento del *e-commerce* es básico*; c) percepción sobre la utilización de los medios sociales:* Facebook, YouTube, LinkedIn, Instagram, Twitter, Blog público, Blog de la empresa, Wikipedia*; y, d) percepción sobre la utilización de los canales de venta de e-commerce:* Amazon; Mercado Libre; Linio; Olx; Ebay; Taobao; *e) aspectos relacionados con el teletrabajo y las competencias del teletrabajador*, no abordados en esta investigación.

La fiabilidad del instrumento se midió a partir de la respuesta previa de diez empresarios quienes no están incluidos dentro de los resultados y entregando un alfa de Cronbach=.902, evidenciando que es fiable para continuar con la investigación (Hair, Prentice, Cano & Suárez, 2007).

Diseño del estudio

Las variables estudiadas son de tipo cualitativo y las preguntas se diseñaron bajo la escala de Likert de 1 a 5 (1=Totalmente en desacuerdo, 2=En desacuerdo; 3=Neutro; 4=De acuerdo; 5=Totalmente de acuerdo). Todas las variables son independientes puesto que el propósito de la investigación no es crear un modelo, sino describir la percepción que tienen las empresas comercializadoras de calzado a través de herramientas sociales de internet y proponer estrategias para que se mejore este proceso en el sector.

Procedimiento

Se utilizaron técnicas estadísticas de carácter descriptivo para la contextualización de la muestra, la técnica del ANOVA para determinar

la influencia de las variables *edad* de las empresas y *formación académica* de los empresarios en las otras varibles, y como técnica multivariante se utilizó el análisis factorial con el método componentes principales y la variación varimax para recargar los pesos de las variables en los componentes (Hair, et al., 2007), para precisar los factores que influyen en la aceptación del *s-commerce* como mecanismo para la comercialización de los productos. El paquete estadístico utilizado fue SPSS versión 23.

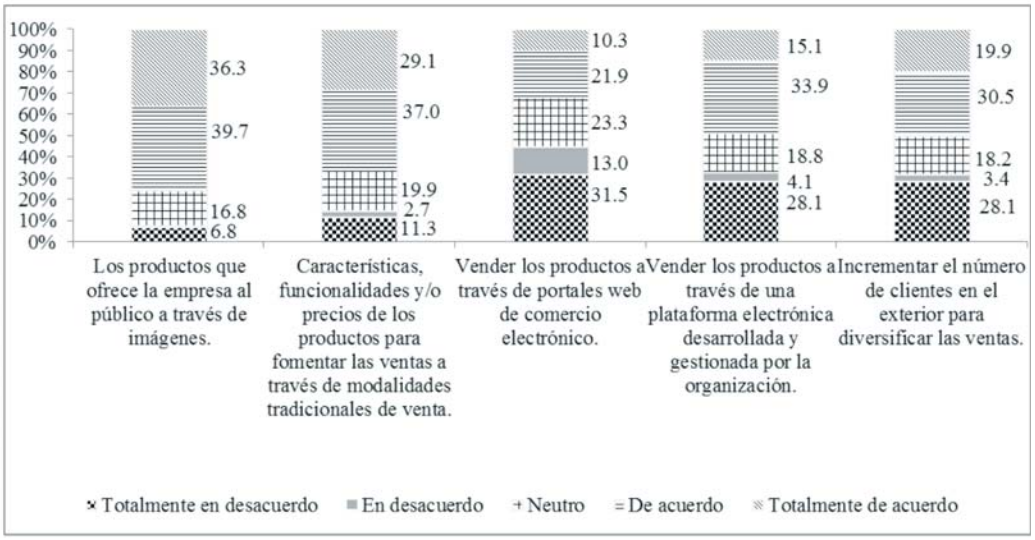
Resultados

La utilización del *e-commerce*

El 49.2% de los empresarios afirma que desde el 2015 utilizan el *e-commerce* como canal de comercialización, donde el 30.1% no tiene una estrategia planteada que se relacione con este aspecto, como ventajas, el 84.1% indica que *favorece la creación de lazos comerciales y nuevos mercados*, el 76.1% que *es un proceso innovador*, el 67.3% que *aporta a la negociación entre las partes*, el 61.1% que *permite la contratación laboral*, el 54.9% que *mejora el servicio al cliente* y el 39.0% que *aporta a la disminución de costos y gastos*.

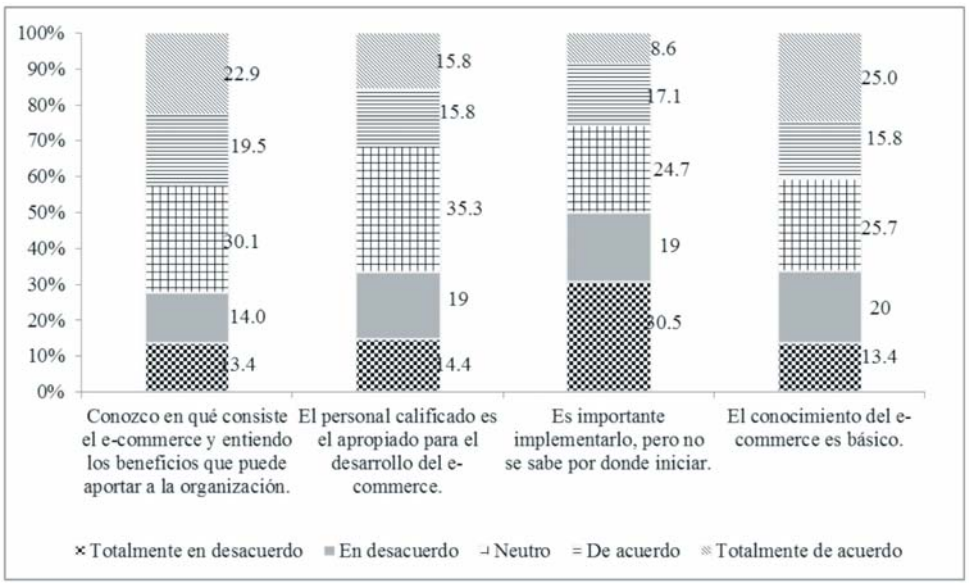
La Figura 1 evidencia la opinión de los empresarios con respecto a los objetivos que se pueden lograr con la utilización del *e-commerce,* destacándose en el *nivel totalmente de acuerdo: los productos que ofrece la empresa al público a través de imágenes* (36.3%) y *las características y funcionalidades que fomentan en las ventas a través de los canales tradicionales* (29.1%); similar ocurre en el *nivel de acuerdo* donde estos ítem representan el 39.7% y el 37.0%, respectivamente, seguidos por *la venta de productos a través de una plataforma electrónica propia* (33.9%) y *el incremento del número de clientes en el exterior para la diversificación de las ventas* (30.5%). Es importante destacar que estos dos últimos ítem tienen una representación del 28.1% para los empresarios, en cuanto a que están *totalmente en desacuerdo* con estas apreciaciones.

Figura 1. Distribución porcentual de la opinión de los empresarios con respecto a los objetivos que se pueden lograr con la utilización del e-commerce. Elaboración propia.



De manera similar a la distribución anterior, la Figura 2 evidencia el grado de acuerdo de los empresarios en cuanto a las razones por las cuales no se ha implementado el *e-commerce* como estrategia comercial dentro de sus organizaciones, donde los empresarios siguen considerando en los *niveles totalmente de acuerdo* y *de acuerdo* las diferentes razones, destacándose en el *nivel totalmente de acuerdo*, *el conocimiento del e-commerce es básico* (25.0%), seguido por *el conocimiento sobre en qué consiste y los beneficios que trae para la empresa* (22.9%). Es de destacar que en el *nivel totalmente en desacuerdo* los ítems *es importante implementarlo pero no se sabe cómo iniciar* (30.5%) es el más destacado.

Figura 2. Distribución porcentual del grado de acuerdo de los empresarios en cuanto a las razones por las cuales no se ha implementado el e-commerce. Elaboración propia.



Al realizar el análisis del ANOVA con la variable *edad*, se determina que las empresas presentan diferencias significativas al considerar *la realización de reuniones de trabajo* ($p < 0.001$), además con la percepción de *la utilidad que tiene el e-commerce para el desarrollo de las actividades comerciales* ($p < 0.003$), con *el objetivo de la organización vender los productos a través de una plataforma electrónica desarrollada y gestionada por la organización* ($p < 0.000$), y, *en las razones que se tienen presentes para adoptar el e-commerce porque se conoce en qué consiste el e-commerce y se entienden los beneficios que puede aportar a la organización* ($p < 0.054$), donde son las organizaciones más antiguas las que ven la importancia de las anteriores apreciaciones sobre el *e-commerce*.

Con el análisis del ANOVA considerando la variable *formación del empleador*, se determina que las empresas presentan diferencias significativas en cuanto a *los objetivos de la organización vender los productos a través de una plataforma electrónica desarrollada y gestionada por la organización* ($p < 0.006$), en *la importancia para dar a conocer las características de los productos de la empresa para fomentar las ventas a través de internet* ($p < 0.014$), con *las razones que se tienen presentes para adoptar el e-commerce porque se conoce en qué consiste el e-commerce y se entienden los beneficios para la organización* ($p < 0.000$), *el personal calificado es el apropiado para el desarrollo del e-commerce* ($p < 0.000$), *es importante implementarlo, pero no se sabe por dónde iniciar* ($p < 0.001$) y el *conocimiento del e-commerce es básico* ($p < 0.000$), donde las organizaciones más jóvenes destacan esta importancia.

Lo anterior se ve reflejado en la utilización de los canales más populares para la comercialización, donde los empresarios destacan como los más utilizados Taobao (98.6%), E-bay (97.9%), Amazon (97.6%), Linio (97.3%) y Mercado Libre (93.2%).

La adopción del *s-commerce*

La Tabla 3 evidencia el grado de percepción de las ventajas que ofrecen las herramientas de los medios sociales para el desarrollo de la actividad económica de la empresa. Se destacan como las más utilizadas en la comercialización de los productos en los niveles *Totalmente de acuerdo y de acuerdo Twitter* (79.8%), *YouTube* (77.4%), *Facebook* (66.4%) e *Instagram* (42.8%), y como las menos utilizadas en los niveles *en desacuerdo y totalmente en desacuerdo Wikipedia* (88.0%) y *LinkedIn* (87.0%).

Tabla 3. Distribución porcentual de la percepción de las ventajas que ofrecen los medios sociales considerando sus ventajas. Elaboración propia.

Medio social	Totalmente en desacuerdo	En desacuerdo	Neutro	De acuerdo	Totalmente de acuerdo
Facebook	3.4	16.8	13.4	26.0	40.4
YouTube	7.5	4.8	10.3	11.6	65.8
LinkedIn	74.7	12.3	4.1	4.5	4.5
Instagram	7.9	31.8	17.8	16.1	26.4
Twitter	7.5	5.1	7.5	12.3	67.5
Blog público	56.2	12.0	10.3	11.6	9.9
Blog de la empresa	50.3	13.7	14.7	9.2	12.0
Wikipedia	78.1	2.4	6.8	9.9	2.7
Baidu	40.4	26.0	13.4	3.4	16.8

Entretanto, la Tabla 4 muestra la distribución de la percepción que tienen los empresarios en cuanto a la utilización de las herramientas de los medios sociales como canales de venta a través de internet, donde en los *niveles de acuerdo* y *totalmente de acuerdo* se destacan *Facebook* (89.3%), *YouTube* (80.5%), *Twitter* (77.4%) e *Instagram* (54.5%), mientras que en los niveles totalmente en desacuerdo y en desacuerdo se encuentran como los menos utilizados *Baidu* (94.9%), *Wikipedia* (93.8%), *LinkedIn* (92.5%) y los *blogs públicos* (78.1%) y de la *empresa*(71.9%).

Tabla 4. Distribución porcentual de grado de acuerdo en cuanto a la utilización de los medios sociales en las empresas. Elaboración propia.

Medio social	Totalmente en desacuerdo	En desacuerdo	Neutro	De acuerdo	Totalmente de acuerdo
Facebook	4.0	5.1	1.6	33.7	55.6
YouTube	3.8	9.2	6.5	1.4	79.1
LinkedIn	83.6	8.9	4.5	1.0	2.1
Instagram	24.0	11.3	10.3	4.8	49.7
Twitter	7.2	9.9	5.5	1.0	76.4
Blog público	69.9	8.2	8.6	6.8	6.5
Blog de la empresa	63.4	8.6	11.3	6.2	10.6
Wikipedia	87.3	6.5	5.1	0	1.0
Baidu	88.7	6.2	4.8	0	.3

Al realizar el análisis del ANOVA con la variable *edad*, se determina que las empresas presentan diferencias significativas destacándose el uso de *Facebook* ($p < 0.007$), *YouTube* ($p < 0.000$) y *Twitter* ($p < 0.000$). De manera similar ocurre con estos medios sociales y la percepción sobre las ventajas que les ofrecen estos sitios a los empresarios ($p < 0.051$; $p < 0.001$; $p < 0.000$), donde son las organizaciones más antiguas quienes destacan la importancia de las anteriores apreciaciones sobre el *s-commerce*. Es necesario destacar que no existen diferencias significativas considerando *la edad* de las empresas y la *utilidad que ofrecen como canal de venta online*.

Con el análisis del ANOVA y la variable *nivel educativo* se determina que las empresas presentan diferencias significativas en cuanto al uso de *Facebook* ($p < 0.053$), *YouTube* ($p < 0.045$), *LinkedIn* (0.000), *Instagram* ($p < 0.000$), *Twitter* ($p < 0.000$) y *Wikipedia* (0.036). De manera similar en cuanto a las ventajas que les ofrecen, estos sitios ($p < 0.054$; $p < 0.045$; $p < 0.000$; $p < 0.000$; $p < 0.000$; $p < 0.000$), donde son las organizaciones más antiguas las que ven la importancia de las anteriores apreciaciones sobre el *s-commerce*. En cuanto a la percepción sobre la *utilidad que ofrecen los canales online de distribución de los productos* se destaca que todos son significativos.

La innovación a través del *s-commerce*

Con la utilización de la técnica análisis factorial se detectaron las razones que los empresarios valoran como importantes para la implementación del *e-commerce*. Un primer componente se orienta hacia dos razones: *de conocimiento*, compuesto por el conocimiento de la estrategia y sobre los beneficios que puede aportar, la calidad de los profesionales para desempeñarse en el área, y *de experiencia*, relacionada con que se es consciente de la importancia de implementarlo, pero no se sabe por dónde iniciar (KMO=0.721; Prueba de esfericidad de Bartlett Chi-cuadrado=439.295 con gl=6 y $p < 0.000$; VE=84.846).

Por otra parte, en cuanto a los objetivos de las organizaciones para la utilización del *s-commerce*, son dos los componentes principales: *promoción* relacionado con la necesidad de dar a conocer los productos a través de imágenes y dar a conocer sus características y funcionalidades para incrementar las ventas; *uso* considerando la venta a través de la plataforma electrónica de la organización y el incremento de los clientes en el exterior para incrementar las ventas (KMO=0.547; Prueba de esfericidad de Bartlett Chi-cuadrado=366.514 con gl=6 y $p < 0.000$; VE=83.209).

De otro lado, el uso de los medios sociales como mecanismos para promocionar los productos de las empresas se orienta hacia dos clases: *generales* orientadas a todo tipo de público, donde hacen parte Facebook, Twitter e Instagram; y *especializadas* donde se encuentran YouTube, Wikipedia y LinkedIn que no tienen como motivo realizar campañas de comercialización de manera directa (KMO=0.684; Prueba de esfericidad de Bartlett Chi-cuadrado=827.426 con gl=21 y $p < 0.000$; VE=80.412). Similar agrupación por componente se encuentra en relación a las ventajas que son reconocidas por las organizaciones (KMO=0.814; Prueba de esfericidad de Bartlett Chi-cuadrado=1070.038 con gl=15 y $p < 0.000$; VE=80.153).

Finalmente, en relación al uso de canales específicos para la distribución de productos online, se encuentran en un solo componente todos los canales: Amazon, Mercado Libre, Linio, Olx, Ebay y Taobao (KMO=0.893; Prueba de esfericidad de Bartlett Chi-cuadrado=2478.794 con gl=15 y $p < 0.000$; VE=80.510).

Discusión

Diagnóstico del sector calzado

Es evidente el desconocimiento de los empresarios del sector para utilizar los canales de comercialización virtuales, por la desconfianza que aún perciben relacionada con la parte lúdica que ofrece internet. Sin embargo, se destaca la importancia que ven en la búsqueda de nuevos mercados que les permitan el incremento de sus transacciones por fuera de la región a que pertenecen. Esto implica que los empre-

sarios reconocen los beneficios del *e-commerce* y del *s-commerce* pero los aspectos relacionados con la falta de confianza y el conocimiento sobre su funcionamiento e implementación impiden que esta estrategia tenga un mayor éxito.

Los objetivos de los empresarios con respecto a la utilización del *e-commerce* presentan una opinión dispar, debido a que la mayoría ven la importancia que tienen los canales, pero aún no están convencidos sobre el aporte que hacen como mecanismos de comercialización para sus productos y servicios, precisamente porque se confunden con el carácter lúdico que ofrecen las redes sociales.

La principal razón que incide en que los empresarios no hayan iniciado sus planes de *e-commerce* en sus empresas se relaciona con el desconocimiento del proceso, y porque no se ha establecido un plan para desarrollar esta estrategia comercial, por este motivo continúan con la utilización de los canales tradicionales de venta, pese a la importancia que han determinado sobre las transacciones comerciales y en la búsqueda de nuevos mercados. Esto se refuerza porque la fuerza productiva que ellos poseen no se encuentra capacitada para desarrollar actividades comerciales por internet y toda la parte estratégica recae en los empresarios, viendo la necesidad de contratar personal que se encargue solo de manejar sus canales de venta online y una posibilidad para esto es la contratación a través de teletrabajo.

Es un hecho que Facebook es la red social más utilizada como canal de venta online informal, puesto que su popularidad favorece la llegada a mayor número de usuarios de la red y su voz-a-voz favorece la interacción entre los usuarios que ofrece el respaldo de las comunidades virtuales. De otro lado, canales especializados como mercado Libre, Amazon, Linio, Oxl son los preferidos por los empresarios como favorecedores para la venta online, sin embargo, dado el desconocimiento de los empresarios por el manejo de estos portales las transacciones virtuales no ocupan un lugar significativo dentro de sus administraciones, pero están abiertos a buscar alternativas para comercializar sus productos a través de estos medios precisamente para abrir sus canales de venta.

Es importante destacar que los empresarios consideran como importantes para la comercialización a los medios sociales, debido a que favorecen la venta de los productos y aminora los costos y gastos, y además se incrementan los clientes a través de la promoción online barata y el voz-a-voz que ofrecen los medios sociales. Precisamente, los empresarios destacan que sus canales de venta oficiales son Taobao, E-bay, Amazon, Linio y Mercado Libre, mientras que como canales informales de venta se encuentran Facebook, Twitter, YouTube e Instagram.

Prácticas innovadoras para el sector

Es necesario que los empresarios consideren crear y desarrollar sus canales de comercialización online de manera que se efectúe un incremento en sus ventas hacia sectores dentro y fuera de la región, pero que se tenga presente el mecanismo que se utilizará para los despachos a domicilio de los productos, pues este puede ser un factor que impide la competitividad del sector.

Es necesario que se tengan presente dos objetivos para la utilización del *s-commerce*, y que se orientan hacia la *promoción* para dar a conocer los productos, características y funcionalidades para el incremento de las ventas y el *uso* de los canales de venta a través de la web de la empresa y del uso de los medios sociales para incrementar el número de clientes que compren los productos. De esta manera será más eficiente el proceso de comercialización de los productos y servicios de la empresa.

Es necesario que los empresarios organicen sus estrategias de venta en *s-commerce* considerando el tipo de medio social hacia donde se dirigen los esfuerzos de comercialización dado el reconocimiento por su popularidad y base de datos de clientes para la comercialización de los productos y que se orientan hacia: el uso de medios sociales *generales* como Facebook, Twitter e Instagram, y la utilización de medios sociales *especializados* como YouTube, Wikipedia y LinkedIn.

La contratación laboral es un elemento esencial que se requiere implementar, debido a que la fuerza laboral que tienen las empresas de calzado de la región se orienta principalmente a la fabricación de calzado y no tienen ni el conocimiento ni la experiencia para encargarse del canal de venta online de la empresa y mucho menos del manejo a través del voz-a-voz, pues el conocimiento sobre el tema se limita a sus operaciones personales. Por este motivo, las empresas deben buscar la contratación a través de teletrabajo permitiendo que este canal tenga una atención más centrada en el cliente de internet.

Por otra parte, es necesario que en el sector se consideren dos tipos de estrategias para la implementación del *e-commerce*, por un lado, se requiere la realización de talleres o cursos que faciliten incrementar el conocimiento de los empresarios con respecto a la estrategia, considerando que son conscientes de la importancia de este mecanismo, y por el otro ofrecer casos de éxito de pequeños empresarios que ya hayan implementado el *s-commerce* como alternativa de comercialización para facilitar la confianza en la contratación de personal para el manejo del canal de venta online.

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Biodiesel in Brazil: Agricultural R&D at Petrobras Biocombustível

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Abstract: The expansion of the use of biofuels is based on the implementation of public policies to support production, technological development and the market. In Brazil, the National Program for the Production and Use of Biodiesel (PNPB) seeks to articulate these incentives and attract private initiative in promoting sustainable production. Investigating the business actions for the development of new technologies in the face of public stimulation motivates this article that aims to analyze the Research and Development (R&D) strategies of Petrobras Biocombustível in the production of biodiesel. The case study is based on the theoretical arguments of the Entrepreneur State and on a case study accompanied by a qualitative analysis. The results indicate that the formation of agricultural research networks favored the construction of knowledge, research infrastructures and training of people, but did not innovated the production of biodiesel.

Keywords: Sustainability; Renewable Energy; Entrepreneurial State

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1. Introduction

The large share of oil in the composition of the world energy matrix has encouraged discussions on several fronts. They bring together, in particular, the debate around themes such as energy security, pollution, increase of greenhouse gas emissions and global warming. Among the ways pointed out are the possibilities and challenges for the production and use of biofuels, ethanol and biodiesel, as alternatives for reducing the consumption of fuels derived from oil, gasoline and diesel.

In this debate are the discussions of Elliot (2000) that places biofuels as complementary or alternative to gasoline and diesel, and therefore immersed in the need for a large and continuous scale of production and the necessary construction and implementation of public incentives. Mowery et al. (2010), also highlight the role of the State in the construction of an environment favorable to the progress of biofuels, and emphasize fiscal and financial incentives as well as taxation of competing technologies and support for technological development as fundamental. In addition to the aspects related to market formation and new technologies. Is also considered the production of biofuels as an alternative for the development of agriculture through the production of raw materials. Similarly, Floray et al. (2012) shows that the use of new technologies, such as biofuels, requires an active state and capable of understanding its role in building spaces connected to the demands of society.

These collected evidences are present in the National Program for the Production and Use of Biodiesel (Programa Nacional de Produção e Uso de Biodiesel - PNPB), a public policy aimed at encouraging the sustainable production of biodiesel in Brazil that seeks to form a new market, through social inclusion and regional and technological development. This program, implemented in 2005, structured in fiscal and financial incentives, compulsory consumption and the Social Fuel Seal (Selo Combustível Social), an instrument that links the access of companies to incentives and the promotion of social inclusion and regional development.

The seal is granted to companies that buy raw materials from family farming present in certain regions of Brazil, especially the Northeast Region. This condition places the PNPB the challenge of the development of agricultural technologies in the production of oilseeds adapted to the characteristics of the familiar regional production. The architecture of the program and its objectives are the subject of debates that highlight the difficulties to be overcome, whether those evidencing the production reality of the Brazilian Northeast (Garcia, 2007) or those that expose the traps placed by the predominance of soybean in the production of biodiesel, strengthened by the limited technological knowledge of alternative raw materials (Abramovay & Magalhães, 2007). Despite the criticisms, the PNPB has advanced and completed twelve years of existence, mobilizing various actions in the different social segments that it seeks to articulate. The most important segment is soybean agroindustry, which accounts for 70% of biodiesel production in Brazil. This mature and widely established agroindustry in Brazilian agriculture is capable of supplying the advance of biodiesel production, at the same time reducing the interest and risk of the technological development of aletrnativas raw materials.

The actions aimed at Brazilian biodiesel production involve the participation of Petrobras Biocombustível, a subsidiary of Petrobras S/A. The subsidiary's strategies are based on the construction of production infrastructure and, unlike the soybean industry, on research and development (R&D). The effort in the search for the technological development involved the organization of the Research Networks in Oilseeds of Petrobras Biocombustível and mobilized 19 public agricultural research centers. Petrobras' differentiated and ariscated position - an innovative company in its main business, oil exploration and refining - motivates the issues that lead to this article. How were research networks organized and conducted? What developments can be identified?

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The coping or incorporation of risks and uncertainties in the development of new technologies and new markets are elements that form an unattractive universe for companies. This instability has an important strategy in the formation of new businesses that characterize the new markets, such as renewable energy, such as the production of biodiesel in Brazil in the State of Entrepreneurship and its ability to reduce uncertainties (Mazzucato, 2014). Thus, the article is organized into four sections beyond this introductory one. The second section presents the contributions made by the Entrepreneurial State of Mazzucato (2014) and the structure of analysis composed by descriptive analysis and case study. Subsequently, the third section discusses the PNPB and its results. The fourth section discusses the elements present in the construction and results achieved with Petrobras R&D strategy for biodiesel production. Finally, the final section deals with conclusions and final considerations.

2. Entrepreneurial Status: the risk of technological development

This section is organized in two subsections. The first subsection presents and discusses the arguments and concepts that structure the theoretical approach of the State Entrepreneur, highlighting the importance of public policies to boost the development of new technologies and new markets, such as biodiesel. In the sequence, the second subsection incorporates the elements of the theoretical discussion to the study methodology that articulates a qualitative descriptive analysis to the case study**.**

2.1 New products and new markets

The development of technologies in renewable energies is fundamental for the transformation of the current energy matrix rooted in the technologies of the fossil standard. The permanence in the fossil pattern excludes the chance of the society to promote a truly transforming space. This transformation requires technologies for recyclable materials, advanced techniques of waste management, improvement of agricultural practices, among other innovations. The starting point, the path to be followed and where the arrival will be are quite nebulous variables of this high risk process (Mazzucato, 2014).

The uncertainty and risk associated with these technologies is rooted in a diverse range of economic segments and in the deep domain of existing technologies. This environment marked by the necessary technological development places the State in the important role of formatting public policies with instruments that enable the execution of and R&D projects and encourage production (Mowery et al., 2010; Olmos, et al., 2010).

For Mazzucato (2014) the role of the State lies in the articulation of the innovation process and also in entrepreneurial actions. The undertaking for the State is in the strategy of taking the risks of technological development and occupying a space of uncertainty that private initiative is not willing to face. This placement originates from arguments built from two fronts of discussion.

The first one is aligned with the concepts and arguments of the evolutionary economy, punctuated, among other evidences, by the competition marked by innovation in products and processes and the search for technological evolution from scientific, technical and tacit knowledge, institutions, processes and organizational forms. As well as machines, equipment and products. In this search, companies are placed as the prime responsibility for innovation, but they are accompanied by governments, research organizations, universities, public policies and other components that form the so-called systems of innovation with repercussions for the development of nations. As for competitiveness in markets, both in industry and agriculture (Dosi & Nelson, 2009).

The second front of discussion deals with the role of the State in economic development and has in the critics of neoliberalism the references for the construction of the arguments that support the vision of Entrepreneurial State. For Mazzucato (2014), the discourse that the public sector is bureaucratic, incompetent, intrusive and intrusive and too big to be dynamic, as opposed to the dynamism, efficiency, entrepreneurship and innovative nature of the private sector, has built the idea that the state must basic services and correcting any market failures. In this vision, it would be up to the State to facilitate the process of innovation and to provide conditions for the private initiative, always available to take risks and invest in R&D.

This way of interpreting reality has emptied the debate about the role of the state in development and has resulted in the shaping of public policies in innovation that built myths. The first of these lies in the direct causality between R&D and innovation - just invest in R&D to innovate - when in fact a series of complementary assets is needed for innovation to occur. The second myth is that smaller firms are more apt to innovate. The evidence shows that the size of companies does not always justify their growth but rather productivity. Another myth is that the number of patents reflects growth in terms of innovation, which in fact in certain markets is much more related to legislation and competitive strategies. Next, the myth that business investment needs fewer taxes and bureaucracy when evidence does not prove that R&D tax credits actually contribute to its development. In addition to these, the myth that venture capital "worships" risk, when in fact it escapes risk and only appears when uncertainties are smaller (Mazzucato, 2014).

Mazzucato (2014) points out that the risks and uncertainties associated with entrepreneurship and innovation linked to investments in R&D and technological change are not always absorbed by the private sector. This entrepreneurial role has in many cases been played by the state with its long-term investments in science and technologys (S&T) and R D, which are materialized in new products, new processes and new markets. The state assumes the risk of betting on fronts so unknown that even the uncertainties are identified, such as the development of the internet. Private initiative participates from the moment the risks and uncertainties of technological development can be identified. The author takes as an example the technologies touchscreen and GPS that gave support to the development and commercialization of iPhone and iPad and that are the result of many years of research financed by the State with the Department of Defense of the United States.

In this sense, the arguments put forward put the State as an active participant in the process of technological development necessary for the adoption of new products and new processes and also for the creation of new markets. This construction has in the interaction between public and private action formatted in public policies the ways to reduce the risks and uncertainties tied to new markets and new technologies.

2.2 Analysis structure

The arguments of Mazzucatto (2014) emphasize the importance of state participation in technological development, in encouraging the formation of new markets. The public incentive to development is permeated by the view that the private initiative seeks to invest in businesses with risk and uncertainty foreseeable. These conditions are not always measurable in new technologies and markets. The difficulty of analyzing new investment scenarios for private enterprise is partly amortized by public action through policies and programs that support specific technologies and markets.

The formatting of structured public policies in support mechanisms and incentives to new technologies and markets is present in the architecture of the PNPB. Thus, the methodology adopted initially seeks to explore the instruments and results achieved with the PNPB, and then, to guide the case study and to identify how the private initiative has internalized the incentives and objectives of the program.

The descriptive analysis of the program was conducted from two stages of research. The first met and analyzed information contained in laws and decrees that regulate the activities and objectives of the PNPB. The second stage worked on statistical series and data on the dynamics of Brazilian biodiesel production from 2005 to 2016, made available by the Agência Nacional de Petróleo, Gás Natural e Biocombustíveis (ANP - National Agency of Petroleum, Natural Gas and Biofuels). The information collected and analyzed in the two stages of research were complemented with results of recent technical-scientific studies that dealt with the PNPB.

The results of the descriptive analysis of the PNPB helped in the case study that, among the different strategies to overshadow the incentives and risks of biodiesel production in Brazil, explored Petrobras Biocombustível's R&D investment strategy, structured in Petrobras Biocombustível' Oilseeds Research Networks. In order to address this case study, in order to identify the company's strategies aimed at biodiesel production, the information provided by the company was gathered through its annual reports, considering the period from 2005 to 2016. The analysis is completed with the treatment of the development of technological development strategies, through interviews with researchers who coordinated research projects in two of the nine networks structured by Petrobras Biocombustível.

The two research networks selected were those dedicated to research with jatropha. The choice of these nets is due to the fact that jatropha is placed as a rustic oleaginous and placed as promising to be produced by family farming in the Northeast Region of Brazil. To apprehend this and previous investments in research, still lacking knowledge about its genetics and breeding, production, harvesting and processing techniques, according to Martins (2010). The interviews were conducted from November 2015 to March 2016, through a script with 12 open questions organized in two categories: network operation and results achieved. The interviewees lead studies carried out at the following public agricultural research centers: Universidade Estadual Paulista (UNESP) Campus de Ilha Solteira, Instituto Agronômico (IAC), Empresa de Pesquisa Agropecuária de Minas Gerais (EPAMIG) and Universidade Estadual de Campinas (UNICAMP), Laboratory of Biotechnology.

In the search to understand the unfolding of this initiative in R&D for the company, an interview was conducted through a virtual process during the month of April 2016 and a structured itinerary in 12 questions and three categories: network objectives, results achieved and future prospects. The interview was directed to the Agricultural Technology Management to the Petrobras Biocombustível.

3. The production of biodiesel in Brazil

The production of biodiesel in Brazil is linked to PNPB and Law 11,097/2005, that inserted biodiesel into the Brazilian energy matrix by mixing diesel oil and biodiesel (BX). Started in 2005 with the optional blend of 2% (B2) of biodiesel to diesel, it reaches 2017 with a mandatory blend of 8% (B8) and projections to 9% and 10% by 2019. The goal of the program is to implement production and the use of biodiesel in Brazil in a sustainable manner, promoting social inclusion, guaranteeing competitive prices, quality, supply and production from different sources of oilseeds in diverse regions. The actions have an interministerial structure, with emphasis on the Ministério de Minas e Energia (MME), Minstério de Desenvolvimento Agrário (MDA), currently transformed into the Secretaria Epecial da Agricultura Familiar e Desenvolvimento Agrário, Ministério da Ciência, Tecnologia e Inovação (MCTI), now Ministério da Ciência, Tecnologia, Inovação e Comunicação (MCTIC).

To achieve its objective, this public policy brings together various instruments and organizations that accommodate a set of incentives and rules for production, commercialization and support for technological development. In the promotion of production are the Programa de Financiamento a Investimentos no Biodiesel, conducted by the Banco Nacional de Desenvolvimento (BNDES) and tax incentives. The commercialization, in a regulated market, is supported by a system of auctions of purchases and quality control, with the participation of the ANP in the organization of the auctions and edition of the technical specifications, and of Petrobras in the control of stock executed through negotiations involving the Purchase of biodiesel in the ANP auctions and the transfer to the diesel distributors that serve the national diesel market.

The financial and tax incentives and the rules of the auctions are linked to the Social Fuel Seal, an identification component granted to the biodiesel producer who acquires a minimum percentage of raw material from family farmers included in the Programa Nacional de Fortalecimento da Agricultura Familiar (PRONAF), executed by the MDA. This instrument for the promotion of social inclusion and

regional development, with emphasis on the Northeast Region and on the oil-producing area produced by family agriculture, castor bean, as Azevedo (2010) points out, was widely publicized in the media and its links and objectives built expectations in the solution of historical problems of this Brazilian region. The biodiesel producer that holds the seal is destined to participate in 80% of the auction volumes and special conditions in access to financing and tax incentives. In addition to these instruments, PNPB also incorporates support for technological development through the Rede Brasileira de Tecnologia de Biodiesel and the Câmara Setorial da Cadeia de Produtiva de Oleaginosas e Biodiesel, which brings together representatives of the various segments of the production chain and created Ministério de Agricultura, Pecuária e Abastecimento (MAPA).

The discussion between the proposed objectives the instruments and the results are based from the beginning of the PNPB in works such as de Abramovay & Magalhães (2007) and Garcia (2007) who, as in García (2016), discuss the difficulties of implementing Development policies without understanding the local reality and joint mobilization of their assets. For example, the regional concentration of production, as in 2016, together, the Central-West and Southern regions of Brazil accounted for more than 80% of the national production, as opposed to the small Northeast Region (ANP, 2017). The regional distribution of production is based on regionalization of soybean production and processing, the main raw material for biodiesel production, responsible for more than 70% of the national production (ANP, 2017). This reality limited the effective participation of other oilseeds capable of promoting the regional distribution of production and the inclusion of family agriculture, especially the one that needs support to consolidate, according to Campos & Carmélio (2009).

The debates about the regional distribution and its relations with the raw materials for biodiesel production intertwine with the questions about the participation of the biodiesel plants. The discussions involve the ample idle capacity and its unfolding for the market and the investments with public resources that were made (Mendes & Costa, 2010). Also, the participation of companies originally associated with the production and processing of soybeans is highlighted, with biodiesel being another business option, as a counterpoint to the formation of new enterprises for a new market (Sampaio & Bonacelli, 2015).

The results built in front of the proposed objectives open space for questions about the scope of institutional arrangements formatted in the PNPB and its limitations to promote development in interaction with private initiative and connected to the needs of society (Pedroti, 2013). This discussion is reinforced when the evolution of the production is observed, accompanying the increase of the mixing percentages and the consumption of diesel. Brazilian biodiesel production jumps from 750 m3 in 2005 to 3.8 million m3 in 2016. According to the ANP (2017), in the period from 2013 to 2016, Petrobras Biocombustível accounted for 10% to 15% of annual production, among the main biodiesel producing companies in Brazil.

In this sense, we have the success of PNPB in the proposal to include biodiesel in the Brazilian energy matrix. But, also, the realization that this capacity did not extend to the promotion of the innovations necessary to reach its objectives of social inclusion and regional development, especially of the Northeast Region of Brazil. These results indicate that the implementation of R&D actions and the construction of technologies, mainly in the production of raw materials, are fundamental for a scenario of enormous technological challenges and restricted indications of the paths to be followed. In this way, the experience of Petrobras Biocombustível, based on investments in R&D, positions itself as a strategy that seeks to break this obstacle built from the PNPB.

4. Agricultural R&D at Petrobras Biocombustível

The implementation of the PNPB and its development, as elaborated in the previous section, built a scenario based on the need for agricultural technological development in oilseeds or raw materials alternative to soy, in order to achieve the objectives of social inclusion and regional development. Under these circumstances, Petrobras Biocombustível created R&D initiatives. To present and discuss the results achieved, this section was structured in two subsections. The first deals briefly with Petrobras' move towards renewable energy and the production of biofuels, especially biodiesel. The second subsection analyzes investments in R & D in oilseed production, observing the actions directed to research with jatropha.

4.1. The Petrobras Biocombustível

The history of one of the main Brazilian companies is permeated by economic aspects inherent in the main market in which it operates - the oil market. But, also, for political and driving issues of the Brazilian economy that influence the choices and paths traced by Petrobras over more than 60 years. The creation of Petrobras takes place amidst polarized discussions that addressed, in particular, the issue of the monopoly on oil. At that time, the private initiatives in the construction and operation of refineries were being absorbed by the state as its knowledge was improved in a broad process of learning from oil exploration to refining and distribution of derivatives. The capacity developed by the company has been expanded with emphasis on investments in oil prospecting and exploration in offshore fields. This strategy expanded the company's oil production capacity and established a broad investment program in S&T and R&D, organized in partnership networks with universities, research institutions and supplier companies.

In the last years the movement of Petrobras involves the generation of electricity, discussions and worldwide actions around sustainable development, biofuels and several other applications for biomass. In this context, the Petrobras System is consolidated with new subsidiaries and expansion of activities, with the production of ethanol, sugar, bioelectricity and biodiesel. In the same period, Brazil achieves self-sufficiency in oil production and Petrobras becomes a signatory of the ONU Global Pacto and announces the discovery of the new oil reserves – Pré-Sal.

The expansion of Petrobras' activities from biofuels can also be seen in other oil companies operating in Brazil. It highlights the partner-

ship between Shell and the Grupo Cosan, creating Raízen, which produces and markets sugar, ethanol and bioelectricity. The same strategy is carried out by BP Brasil with the participation in Tropical Bioenergy. Also, it is worth highlighting the Brazilian euphoria with the possibility of the country assuming a prominent position in the world production of biofuels.

These conditions are important in the construction of the creation strategies in 2008 of Petrobras Biocombustível, which brings together Petrobras' activities related to the production and commercialization of ethanol and biodiesel. Particularly for biodiesel, the company's operations began in 2006 with the installation of an experimental plant in the Northeast region of Brazil for the production of biodiesel, associated to the intensification of R & D activities related to the production of biofuels and other applications, for example Biolubricants and the interactions between biomass and petroleum products (Petrobras, 2005).

The creation of Petrobras Biocombustível brought together actions aimed at the construction of three biodiesel production plants. A located in Candeias, Bahia, where Petrobras operates the production terminal for the Refinaria Mataripe. The second plant located in Montes Claros, Minas Gerais, and the third in Quixadá, Ceará (Petrobras, 2006). The biodiesel production infrastructure was reinforced with the acquisition of 50% of the BSBios plant located in Marialva, Paraná. As well as 50% of the shares of BSBios Indústria e Comércio de Biodiesel Sul Brasil, Passo Fundo plant in Rio Grande do Sul and 50% of Bioóleo Industrial e Comercial SA, located in Feira de Santana, Bahia, by crushing oilseeds (Petróleo, 2010).

This move of the company established the production structure for biodiesel, from three own plants located in the Northeastern Region and the semi-arid region of Brazil, in addition to two plants operated in partnership in the South Region. Petrobras Biocombustível also organized two clearly integrated strategies associated with instruments formatted in PNPB and its objectives of social inclusion and regional development. One of them, the o Programa de Apoio à Produção de Oleaginosas pela Agricultura Familiar and the Redes de Pesquisa em Oleaginosas da Petrobras Biocombustível, focus on this article and work on the next subsection.

4.2. The Redes de Pesquisa em Oleaginosas da Petrobras Biocombustível

In order to work on the strategy of creating the research networks of Petrobras Biocombustível, it is important to retrieve elements that deal with the management model of Petrobras R&D activities and the financing sources provided for in legislation. Since 2006, Petrobras' R&D management model has been organized in 49 thematic networks distributed in the following topics: 14 in oil and gas production, 13 in refining and petrochemicals, 6 in oil and gas exploration, 5 in materials, 4 In environment, 3 gas and energy, 2 for advanced computing. And an for technological management and another that opens up research on bioproducts.

In the bioproducts research network, technologies are being developed in evaluation of glycerine injection for advanced oil recovery and tests for the production of second generation ethanol from sugarcane bagasse. Also in evaluation of new methodologies for emissions measurement and evaluation of the potential of different types of vegetation in CO_2 sequestration. The research network on bioproducts also aggregates studies for the production of microalgae in hypersaline waters, production of lubricant from castor biodiesel (biofuel), production of polystyrene from soybean oil, production of gasoline and diesel oil from of bio-oil of wood. Biodiesel production with tilapia oil, produced from the viscera and mixed with 10% of bovine tallow (Tecnologia Petrobras, 2011, 2012, 2013). In addition, this research group is also part of the activities of the network in bioproducts the research areas of the Redes de Pesquisa em Oleaginosas da Petrobras Biocombustível

Redes de Pesquisa em Oleaginosas da Petrobras Biocombustível were established in 2010 through agreements signed by the Centro de Pesquisa da Petrobras (CENPES), which applies financial resources and accompanies the execution of research projects, including subsidies such as Petrobras Biocombustível. Prior to the creation of Petrobras Biocombustível, there were already research projects with oleaginous plants in progress that were integrated into the Networks. These projects are those linked to agreements with public agricultural research centers, allocated to networks 6, 8 and 9, as shown in Table 1. The other research projects were signed as of 2010, except for the Jatropha Network, object of this study, which was started in 2009.

According to information gathered from the interviews, the selection of related oilseeds followed different criteria. For castor beans the justifications were the existence of a defined production system, the Semiárido region and family farming as a traditional producer. The sunflower for having the potential to adapt to the crop in the Northeast, but dependent on technical-scientific knowledge for its production. The palm, traditional culture, cultivated in Pará and Southeast of the State of Bahia, with a system of cultivation suitable for both large extensions and family farming. For Jatropha, expectations about this little-known "new oilseeds", but with national and international research, were promising for production by the family farming of the Northeast. The macaúba, also a "new oilseeds", the rusticity and being a native plant in Brazil present in several biomes, offered the contours for its inclusion in the research networks. In addition to these oleaginous crops, other crops were also investigated prior to the formation of nets, such as soybean and canola, and prospectively the tucumã, inajá and faveleira.

Quadro 1 Redes de Pesquisa em Oleaginosas da Petrobras Biocombustível

	Rede	Participantes
1	Development of production systems of sunflower, castor bean and jatropha focused on Semiárido family farming	Universidade Federal do Ceará (UFC), Universidade Federal Rural do Semiárido (UFERSA), Instituto Agronômico de Pernambuco (IPA), Universidade Federal da Bahia (UFBA), Empresa de Pesquisa Agropecuária de Minas Gerais (EPAMIG), Universidade Federal de Campina Grande (UFCG) e Universidade Federal Rural do Rio de Janeiro (UFFRJ)
2	Technological development for the sustainable exploitation of macaúba	Universidade Federal de Viçosa (UFV), EPAMIG, Universidade de Montes Claros (Unimontes) e Universidade Federal de Minas Gerais (UFMG)
3	Development of cultivars and transfer of castor oil production technology	Instituto Agronômico (IAC)
4	Development of castor bean cultivars for the production of biofuel	Universidade Federal do Recôncavo Bahia (UFRB)
5	**Technological development for jatropha**	**IAC, EPAMIG e Universidade Estadual Paulista (UNESP)**
6	**GENDIESEL - Genome of castor bean and jatropha**	**Universidade Estadual de Campinas (UNICAMP)**
7	MAPINDIESEL - Proteomics of oleaginous species to improve biodiesel production: castor bean and jatropha	Universidade Federal do Rio de Janeiro (UFRJ), UFC e UNICAMP
8	Adequacy of oilseed cropping systems and evaluation of the economic, social and environmental impacts resulting from their production	Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA)
9	Prospecting, domestication and selection of new oleaginous for biodiesel production	EMBRAPA

Fonte: Gonçalves (2011)

The results of the interviews indicate that, on the side of those who accessed the financial resources destined to network 5 "Technological development for jatropha", the contact with Petrobras occurred in a personal way, through relations between researchers who already developed researches with jatropha before the formation of the networks, and those responsible for the strategy with CENPES. In this process, the interested researchers and the related research organizations started the registration procedures with the ANP, a legally required step for any research project, as well as completing the forms and gathering the necessary documents to submit the research proposal Petrobras' evaluation criteria.

After several adjustments, UNESP became the coordinator of the network, which hosted three projects: Basic and applied technology development for jatropha, executed by UNESP, Biotechnologies suitable for the genetic improvement of jatropha in order to obtain interspecific hybrids, under the control of the IAC, and jatropha as an alternative of raw material for the production of biofuels, linked to EPAMIG.

During the execution of the research projects, from 2009 to 2015, meetings were held with CENPES to present the results achieved and discuss the steps to be taken. Likewise, the CENPES team also visited the research centers to follow up the activities and the experiments carried out. In this process, the EPAMIG project was disconnected from the jatropha network and financial resources were allocated to the IAC project. In addition to face-to-face control, there was the preparation of activity and financial reports related to the application of resources, as well as the control of publications and dissemination of the results achieved with the projects.

In the investigation of the contribution achieved with the projects, the interviews allow to highlight the advances in the knowledge of the jatropha culture. At present, it is a consensus that the expected rusticity has not been confirmed, that there is potential for more than one crop per year and that the production of jatropha consorted with other crops is shown as a feasible and necessary way for the viability of the crop as an alternative Family farming. From the point of view of the genetic knowledge of the plant, the project allowed the increase of the germplasm bank with non-toxic materials, important in the use of oil byproducts, protein-rich bran, also the selection of small specimens, fusário tolerant, uniformity of maturation and conformation of the productive cycle.

The researchers also highlighted the training of human resources, including foreigners. There were more than twenty research grants for students of scientific initiation, masters and doctors, as well as several publications, theses and dissertations with culture as focus. Likewise, the partnership with other research centers, especially in Mexico. Also, it is worth mentioning the development of research based on the results achieved with the GENDIESEL project and the partnership with

researchers from the Oswaldo Cruz Foundation (FIOCRUZ). Another result mentioned was the improvement of the research infrastructure, through the acquisition of equipment, construction and adaptation of the facilities. In this regard, in particular at UNESP, laboratories and a pilot plant for the production of biodiesel were created and equipped, thus creating a favorable environment for new research to be carried out, as well as the formation of the largest experimental field of jatropha. Likewise, the accreditation of research centers is seen as an important element for new opportunities with Petrobras.

The information gathered from the interview with gerencia de tecnologia agrícola by Petrobras Biocombustível indicates that the expected results with the networks have been achieved, but each agreement and project has its particularities. The practical or strategic knowledge was applied to the operations with the Programa de Apoio à Produção de Oleaginosas pela Agricultura Familiar. But, the results in basic research still require further efforts to be applied. When considering the operation of the networks as a whole, it was observed that there are more collaborative institutions and others less. Such as the macaúba research network, in which the works were carried out in an integrated way with good results, different from the network of "Development of systems ", which had a large number of research institutions, but with difficulties in its management.

Considering the results achieved for jatropha, a perennial crop, the continuity of support for research projects is pointed out as fundamental for this raw material to effectively contribute to the production of biodiesel. This action by Petrobras Biocombustível was expected by the project coordinators. But, during the interviews it was pointed out that from 2012 there was a certain weakening of the actions gathered in the networks and the vision of closing the activities was present. Despite the discontinuity and interruption of the research, it was indicated that without the support of Petrobras Biocombustível, the research carried. This not only for the resources invested, but also for the important actions in the articulation of the research centers for the construction of new paths for the technological development of raw materials for biodiesel production in Brazil. As pointed out by Scoponi (2016), the articulation and cooperation among research institutions is fundamental for boosting agricultural innovation, constituting established and long-lasting research networks.

At Petrobras Biocombustivel the research networks were finalized and the orientation is to discontinue the development of oilseed research for biofuels. At the time of the debutant, there was no prospect of resuming activities. It was commented, however, that the lessons learned in the period from 2008 to 2016 are being considered. That the company will continue to work, through its mills, in the promotion of the acquisition of raw materials from family farming aimed at participation in the purchase auctions of Biodiesel promoted by the ANP, with no plans to implement new projects.

On the other hand, the research institutions that participated in the jatropha network seek two paths. The first one related to the continuity of the researches and maintenance of the experiments with the objective of avoiding losses, through new research projects submitted to the development agencies, for example, the Fundação de Amparo à Pesquisa do Estado de São Paulo (FAPESP) and others sources, in a strategy with no prospect of relying on the private initiative. The second path identified was the abandonment of research with jatropha and the directing of efforts to other crops, in the face of the disillusionment with the possibilities of jatropha participation in the production of biofuels

Petrobras Biocombustível also invested in other fronts, such as the use of geoprocessing as a tool to support the management of the application of resources in areas with greater productive potential. In 2012, the company systematized its safety, environmental and health processes and created the Corporate Waste Management Plan. In 2013 and 2014, in partnership with Embrapa, it implemented twelve Unidade de Teste e Demonstração (UTDs) with castor bean in the Semiárido region, as well as researches on fish oil, algae and macaúba, as commented above. In 2015, it completed and implemented the Geographic Information System, which allows, through the Internet, geographic, environmental and agricultural performance analyzes, providing detailed information that improves management.

5. Conclusions

The search for new paths in energy generation highlights the production of biofuels and the need to format public policies. These public action instruments seek to encourage the formation of new markets and the development of these new technologies. In Brazil, the PNPB is an example of these initiatives that are based on the sustainable production of biodiesel, through economic viability, social inclusion and regional development. This program is structured on fiscal, financial and technological incentives that mitigate the risks of a new market and attract private initiative in the construction of strategies. Among the companies participating in the PNPB, the soybean agroindustry, the main raw material used, and Petrobras Biocombustível stand out.

The company, a subsidiary of the oil company Petrobras, structured strategies that involved broad support for R&D activities, aiming at the development of alternative raw materials for soybeans, gathered in Petrobras Biocombustível Oilseed Research Networks, which is the object of the study. The arguments of the Entrepreneur State that highlight the importance of the State in the development of new markets and new technologies led to a descriptive research and case study to investigate the training, conduction and results achieved with the Networks.

The results show the interest of Petrobras, an innovative company of international renown, in the development of research involving biomass in its various applications, including biofuels. For biodiesel, the company structured production and R&D strategies with a view to aligning PNPB instruments with their objectives. Experience with agricultural research and its public centers has resulted in important advances in knowledge with oilseeds, especially jatropha, building infrastructure and training of people, as well as the difficulties to continue the work in the face of the closing of investments. The results also show the fragility of the relationship between the research centers and the company. Exposes the company's distance from the timid application of the knowledge achieved and thus, highlight the discussions about R&D

risks and private initiative in the production of Called the background research, to the same extent that it highlights the limits of the PNPB in involving companies in the development of new technologies.

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Ciencia, Tecnología y Mercado: Investigaciones en Arroz en el INTA Argentino

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Resumen: La importancia del conocimiento en las sociedades contemporáneas, y de su creciente rol en diversas dinámicas productivas y sociales, constituye una temática ampliamente abordada. Asimismo, la disputa por el acceso a distintos bienes comunes naturales es una preocupación de agenda, en particular para las sociedades latinoamericanas. ¿Qué ocurre con la producción de conocimiento científico implicado en la obtención de un recurso crecientemente disputado como las semillas? Este artículo analiza una trayectoria de investigación orientada a la obtención de variedades de arroz resistentes a herbicidas, radicada en el Instituto Nacional de Tecnología Agropecuaria (INTA) argentino. Se exponen las dinámicas de producción y uso de conocimientos científicos y tecnológicos generados con fondos públicos. Mediante documentos institucionales, marcos regulatorios y entrevistas a científicos y técnicos, se analizan las implicancias sociales, económicas y políticas derivadas de la organización de la producción y apropiación del conocimiento, en un sector históricamente relevante como el agro.

Palabras clave: semillas; ciencia; arroz; producción; apropiación; conocimientos científico-tecnológicos; bienes comunes

Abstract: The importance of knowledge in contemporary societies and its growing part in variant productive and social dynamics constitute a widely discussed subject. Additionally, the dispute over the access to various natural common goods is a concern in today's agenda, particularly for Latin American societies. What about the production of scientific knowledge involved in procuring increasingly contended resources such as seeds? This paper studies the trajectory of an investigation into the process of obtaining varieties of rice which are resistant to herbicides, led by the National Institute of Agricultural Technology (INTA), in Argentina. An insight is provided into the dynamics of production and the use of scientific and technological knowledge funded by the government. Based on institutional documentation, regulatory frameworks and a series of interviews with scientists and technicians, we have analyzed the social, economic and political implications that come with the organization of the production and the appropriation of knowledge in the historically relevant area of agriculture.

Keywords: seeds; science; rice; production; appropriation; technical-scientific knowledge; common goods

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Introducción

¿Qué implicaciones conlleva la producción de ciencia y tecnología en países que no integran la reducida lista de potencias mundiales? ¿Existe una ciencia hegemónica y una periférica? ¿Qué vinculaciones se establecen entre las comunidades científicas, el mercado, los decisores políticos y las poblaciones implicadas? Estos y otros interrogantes han sido abordados, desde diversos enfoques, tanto dentro del campo de estudios centrado en el análisis de las relaciones entre ciencia, tecnología y sociedad (CTS), como desde distintos aportes disciplinares, provenientes de la economía del cambio tecnológico, la historia social de la ciencia, y las relaciones internacionales, entre otras. Enfocando experiencias latinoamericanas, ha sido discutida la excelencia académica en la periferia en perspectiva histórica (Cueto, 1989), la existencia de "ventanas de oportunidad" (Pérez, 2001), la industrialización de conocimiento en el "centro" (Kreimer, 2011), entre otras temáticas relevantes.

Por otro lado, el extractivismo en América Latina, entendido como una forma específica de explotación y apropiación de la naturaleza, ha sido objeto de numerosos estudios que han indagado sus implicaciones económicas, políticas y culturales. La atención recibida por esta problemática no es casual. Por su disponibilidad de recursos, América Latina fue, y continúa siendo, una tierra de oportunidades para la rentabilidad capitalista. Según un informe del BID, hasta el 2003 concentraba el 23% de la tierra cultivable, el 46% de los bosques naturales y el 31% del agua dulce del mundo (BID, 2003, p. 19, citado en Manzanal, 2012). Dentro de los trabajos que han tomado al extractivismo como objeto de estudio, se ha analizado en forma creciente la apropiación de conocimientos asociados a la explotación de aguas, tierras, semillas, minerales. En estos trabajos, los conocimientos nativos, originados por comunidades indígenas y campesinas, han recibido una gran atención, ligada a la histórica expropiación de estos saberes (Caldas, 2004; Ribeiro, 2001, entre otros). Por el contrario, la apropiación de conocimientos científicos vinculados a la naturaleza y generados con fondos públicos en los institutos de investigación de América Latina ha sido poco explorada. Sin embargo, también su dinámica de producción se encuentra directamente asociada a conflictos provocados por las tensiones entre las matrices productivas vigentes, y los modos diferenciados de acceso a los bienes comunes naturales. Partiendo de estas problemáticas, este artículo presenta un estudio de caso, a partir del cual se analiza la producción, uso y apropiación de conocimientos científicos obtenidos en Argentina, orientados a la obtención de semillas genéticamente modificadas.

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¿Por qué considerar las semillas? En ellas se expresan de manera particular las contradicciones entre rentabilidad y derechos. Son la base de la soberanía alimentaria a escala planetaria y, al mismo tiempo, el eje sobre el que se tejen negocios millonarios que incluyen a la producción semillera en sí, insumos agrícolas ligados vertical y horizontalmente a ésta, y cadenas de producción de conocimientos científicos y tecnológicos que dan como resultado cultivos modificados. Estas tensiones se expresan desde la propia definición de los recursos fitogenéticos. Así, según la *Food and Agriculture Organization* (FAO), de Naciones Unidas, se denomina "recursos fitogenéticos" a "todo material genético de origen vegetal de valor real o potencial para la alimentación y la agricultura" (FAO, 1996: 3). También remarcando su importancia en la alimentación, el Instituto Nacional de Tecnología Agropecuario (INTA) argentino señala que "Los recursos fitogenéticos son mucho más que insumos básicos para los programas de mejoramiento de las especies cultivadas: *son base de la alimentación de la humanidad*" (INTA, 2009, p. 2, subrayado propio). Este artículo aborda estas tensiones a la luz de una dinámica de producción científica y tecnológica radicada en el INTA de Argentina. A partir de la reconstrucción de una trayectoria de investigación orientada a la obtención de variedades de arroz resistentes a herbicidas, iniciada en 1996, se analizan conflictos presentes en la utilización comercial de conocimientos científicos generados con fondos públicos. También se señalan vinculaciones entre la forma de organización de la producción del conocimiento, y el modelo extractivista vigente en el agro, en particular en lo referente a la exportación de *commodities* agrícolas. Para ello, se revisan convenios de vinculación entre el INTA y empresas involucradas en la producción de agroquímicos y semillas, y se discute para qué y para quiénes se orientan los programas de investigación y extensión rural.

En esta dinámica, el Estado es analizado como actor que participa en las controversias, tanto como ámbito en el que se dirimen los conflictos. Por otro lado, el conocimiento científico es entendido como bien común (Coriat, 2015). La noción de "bienes comunes" es una definición de carácter teórico-político, que aboga por una relación no mercantilista y comunitaria de aquellos recursos básicos para la supervivencia y reproducción social de las comunidades (Helfrich y Haas, 2008). La denominación alude metafóricamente a las *commond lands*, tierras de uso común existentes durante el medioevo europeo en las que existían dinámicas comunitarias de producción y un heterogéneo esquema de relaciones de solidaridad y ayuda mutua. Mientras que la transición del feudalismo al capitalismo tuvo en el proceso de cercamiento de tierras un hito fundamental, la literatura que aborda el estudio de los comunes ha analizado diversos procesos de cercamientos que avanzan en la privatización de elementos fundamentales para el desarrollo de la vida humana. Dentro de este enfoque, en el que cabe mencionar los aportes pioneros de Ostrom (2000), una gran cantidad de trabajos analizan la producción de conocimiento y los sistemas de "acceso abierto", desde el punto de vista de la producción académica, la generación de datos informáticos, y de diversos procesos productivos enmarcados en la era del denominado "capitalismo cognitivo" (Vercellone, 2011).[1] Por otro lado, una serie de estudios analizan la apropiación de los bienes comunes naturales, como el agua, la tierra, los minerales, la energía y las semillas. En este artículo abordamos una transición entre ambos ejes analizando una producción cognitiva asociada a un bien común natural, como entendemos son las semillas.

El primer apartado presenta el caso de estudio, describiendo las principales características de la trayectoria de investigación estudiada. El segundo, analiza la apropiación y comercialización de los resultados, problematizando la mercantilización del conocimiento. El tercero presenta un breve recorrido por la historia de la tecnología agropecuaria en América Latina, señalando sus implicancias políticas, económicas y culturales. En las conclusiones se exponen los resultados obtenidos. A partir de materiales documentales y de entrevistas a técnicos y científicos, se analiza así una dinámica de investigación centrada en el cultivo comestible más importante del mundo, el arroz.

1. Trayectoria de una investigación

El arroz es una planta herbácea anual, de la misma familia que el trigo, la avena o el centeno. En términos económicos y sociales, posee una importancia singular: es el cultivo comercial comestible más importante del mundo. Es decir, forma parte de uno de los principales engranajes de producción y comercialización de mercancías primarias, de donde derivan ganancias millonarias que son concentradas por un puñado de empresas transnacionales. Y, al mismo tiempo, es una pieza fundamental para la soberanía alimentaria. La investigación orientada al mejoramiento genético en este cultivo posee una larga trayectoria en América Latina. En particular, dentro del INTA argentino, el primer organismo abocado a la investigación y extensión rural de toda la región, diversos equipos de técnicos se dedicaron a su estudio y experimentación. Dentro de las trayectorias de investigación recientes, uno de ellos logró alcanzar un resultado único a nivel mundial: la obtención de variedades de arroz resistentes a herbicidas del grupo de las imidazolinas. ¿Qué características tuvo este desarrollo? ¿Y qué impacto supuso a nivel internacional?

Existen tres tipos de tecnologías utilizadas para inducir la resistencia a herbicidas en arroz. Una de ellas se orienta a la resistencia al glufosinato, el herbicida es comercializado bajo la marca Liberty Link® por la empresa multinacional Bayer CropScience. La segunda induce resistencia al herbicida glifosato, que es vendido con la marca comercial Roundup Ready® por la firma Monsanto. La reciente fusión entre ambas firmas, liderada por Bayer, reduce aún más este esquema. Finalmente, la tercera genera resistencia a herbicidas de la familia de las imidazolinonas, es conocido comercialmente como Clearfield® ("campo limpio") y comercializado por la empresa BASF. Ésta última opción fue la elegida por el INTA.

Los investigadores buscaron obtener variedades de arroz con este tipo de resistencia, ya que la misma es obtenida por mutagénesis, un

(1) Para una revisión crítica de diversas perspectivas ligada al capitalismo cognitivo, véase la realizada por Sztulwark y Míguez (2012).

proceso que no implica la implantación de un gen extraño a la planta. A diferencia de lo sucedido en las otras dos opciones, en este caso la nueva semilla obtenida no es considerada por la regulación vigente un organismo genéticamente modificado (OGM), ya que la planta resultante no recibe un gen de resistencia al herbicida que proviene de otro organismo. Esta característica, buscada por la restringida aceptación de los transgénicos a nivel mundial, fue una de las razones de peso, sumada también a su factibilidad y propiedades. En palabras del director del equipo de trabajo, el Dr. Alberto Livore, "Elegimos esos herbicidas por sus propiedades, tanto como controladores de maleza como también por el bajo impacto ambiental, y porque existían antecedentes en otras especies que nos hacían pensar que era posible" (Livore, 2013, entrevista). Así, la efectividad en el control de un amplio espectro de malezas, como el arroz colorado, cyperaceas y gramíneas perennes, sumado a un alto rendimiento y al hecho de implicar la obtención de un cultivo transgénico, aparecen como los principales argumentos en la elección.

Radicado en la estación experimental agronómica de Concepción del Uruguay del INTA, situada en la provincia de Entre Ríos, en el noreste argentino, el equipo de investigación comenzó las investigaciones en el año 1996. En el equipo convivieron perfiles profesionales distintos, que garantizaron un tratamiento integral de las nuevas variedades. De sus doce integrantes, solamente cuatro se dedicaron a fitomejoramiento, los demás se especializan en ecofisiología y patología vegetal, como estrategia para garantizar que las variedades tengan todos los atributos propios de un alto rendimiento. En cuanto al proceso de mejoramiento, la utilización de herramientas biotecnológicas, como los marcadores moleculares, fueron un elemento estratégico para la reducción de tiempos, por posibilitar la identificación temprana de características de difícil detección. Sin embargo, según los investigadores, el núcleo duro del trabajo sigue siendo la selección tradicional. En otras palabras, el ojo del mejorador no ha sido, al menos todavía, suplantado por otros procedimientos.

Luego de más de una década de pesquisas, el equipo obtuvo cuatro mutantes, de los cuales lograron patentar dos. "Puitá INTA CL", en el 2004, es una variedad de arroz de ciclo corto, alto rendimiento agrícola y calidad culinaria. Fue inscripta en el Instituto Nacional de Semillas (INASE) el 22 de agosto de 2005. "Gurí-INTA CL", la segunda variedad, fue inscripta en el INASE en febrero del 2011. Esta último mejoró el rendimiento de su antecesora, combinando las características de resistencia a herbicidas con las de alta calidad industrial y culinaria de la variedad. Ambas fueron las primeras variedades de alto rendimiento y calidad, con adaptación a climas subtropicales y tropicales, resistentes al herbicida conocido comercialmente como "Clearfield". Como señalamos, el hecho de tratarse de variedades no transgénicas permite su comercialización sin trabas hacia los países que levantan barreras contra estos cultivos.

A nivel mundial, existía un único desarrollo similar al alcanzado por los investigadores del INTA. También producido en una institución oficial, en este caso la Universidad de Louisiana, en Estados Unidos. Dos años antes que se conocieran los resultados del INTA, esta Universidad comunicaba que habían logrado un mutante resistente. Sin embargo, el equipo argentino logro obtener la patente ya que pudo probar que obtuvo un mutante distinto. Según explica el director del equipo, "Nosotros probamos que nuestro mutante era diferente porque la mutación se encuentra en otro lugar del gen y de esa manera se pudo obtener la patente" (Livore, entrevista, 2013).

Culminada la investigación, con el consecuente prestigio y reconocimiento académico conseguido por los investigadores argentinos, restaba un paso fundamental. ¿Qué ocurriría con los resultados de la investigación que finalmente, luego de años de sostenidas inversiones, habían sido alcanzados?

2. Mercantilización de la ciencia y privatización de las semillas

A lo largo de la investigación orientada a desarrollar variedades de arroz resistentes a un grupo de herbicidas, el INTA contó con dos socios del sector privado. El primero, la Fundación ProArroz, una organización creada en 1994 por importantes capitales de la cadena del arroz (semilleros, molinos, multiplicadores), cooperativas de productores y el propio INTA, con el objetivo de "promover el desarrollo del cultivo del arroz a través de la generación y difusión de tecnologías", según su propio estatuto. El aporte de recursos financieros por parte de la Fundación es destacado por los integrantes del Programa de Mejoramiento de arroz de INTA, porque "cubrieron los altibajos que normalmente se producen en las instituciones públicas" (Livore, entrevista, 2013). En octubre de 2004, el organismo y la Fundación firmaron un convenio para la producción y multiplicación de las variedades liberadas. Así, en Argentina, la producción de semilla original de estas variedades está a cargo de esta Fundación, al igual que el cobro de regalías. Es la única productora de semilla original autorizada para la venta de las variedades de INTA a los semilleros fiscalizados inscriptos en el INASE. Mientras que a nivel local la multiplicación y venta es responsabilidad de la Fundación, un tercer participante para su expansión comercial internacional es la empresa BASF.

De origen alemán, BASF es una multinacional que lidera la industria química a nivel mundial. Creada en 1865, posee plantas productivas y oficinas de venta a lo largo del mundo. Es, además, propietaria de los herbicidas que fueron utilizados por los investigadores del INTA como objetivo para obtener la resistencia. El interés de la firma en estas investigaciones era directo: al momento de disponer de un arroz resistente, aumentaría el mercado de sus herbicidas. Las variedades desarrolladas por el INTA son resistentes al herbicida Kifix®, desarrollado y comercializado por BASF.

Mientras que en un inicio la firma participó en la tarea de secuenciar los genes obtenidos, lo que permitió identificar qué mutaciones eran y su originalidad, una vez obtenidos los resultados, avanzó en un acuerdo comercial. El INTA le otorgó a la empresa la exclusividad de la licencia de uso del gen en todo el mundo, exceptuando a la Argentina y Uruguay, donde retuvo la administración de los derechos de propiedad de la patente. El Convenio firmado entre ambos, posee 10 años de duración, con opción a renovación. De esta forma, la difusión y comercialización a nivel mundial corre por cuenta de una empresa transnacional.

Gráfico 1. Privatización de conocimiento:

Fuente: Gárgano (2013)

Los resultados de la investigación fueron recibidos como un verdadero éxito. Tanto para los investigadores en particular, como para el INTA y los funcionarios del sector agropecuario en general, éste radicaba en su proyección internacional. Así, que las variedades pudieran ser comercializadas en todos los países productores de arroz, demostraba la capacidad de generación de tecnología de impacto por parte del INTA. Esta visión también está presente en la literatura académica. En este sentido, el trabajo de Fuck y Machado Bonacelli (2009), quienes realizaron un estudio comparativo entre el INTA y Embrapa, tomó a este mismo convenio entre INTA y BASF como un ejemplo de articulación público-privada virtuosa. Si bien no analizaron la trayectoria de la investigación y se limitaron a mencionar la firma del convenio, destacaron que tanto éste como otros acuerdos similares le permitirían al INTA "expandir sus actividades de investigación", y tener "una posición de liderazgo internacional" (Fuck & Machado Bonacelli, 2009, p. 39). Así, en la tesis de los autores todas las partes saldrían beneficiadas: los "socios" (las empresas) y los productores (quienes con mayores rendimientos alcanzarían mejores ganancias), y el INTA. Cabe preguntarnos, ¿es real esta imagen sin tensiones aparentes? ¿Todos ganan? La caracterización de los académicos no solamente reproduce los argumentos de los propios científicos, también omite especificar qué tipo de productores son los que pueden acceder al paquete tecnológico y alcanzar mejores rendimientos. Y, fundamentalmente, deja en un mismo plano a los beneficios alcanzados por la firma transnacional, BASF, y a los recibidos por el organismo de investigación local en concepto de regalías. Sin embargo, la relación dista de ser simétrica.

En el 2014, BASF obtuvo ganancias por 74 millones de euros. Solamente la división "Productos Agrícolas" generó ventas por 3.354 millones. Según su propio portal, la firma tiene como objetivo "convertir rápidamente el conocimiento en éxito de mercado". Ciertamente, éste parece haberse cumplido en el acuerdo alcanzado con el INTA. Al mismo tiempo, afirman que su liderazgo en innovación agrícola permite optimizar la producción "mejorando la nutrición y por lo tanto, realzando la calidad de vida para la creciente población mundial". En esta línea, afirman que a través de la ciencia y la innovación, ayudamos a nuestros clientes de casi todas las industrias a satisfacer las necesidades presentes y futuras de la sociedad" (BASF, web). Sobre este punto, la evidencia no abunda.

3. Tecnología agrícola en América Latina: ¿saberes colonizados?

Durante milenios la domesticación de plantas fue realizada en forma colectiva, generando un progresivo incremento de los rendimientos de la mano de múltiples procesos de cruza y selección. Desde los comienzos de la sedentarización y la agricultura hasta nuestros días, hace más de 10.000 años, la humanidad ha generado y acumulado un caudal inmensurable de conocimiento. Éste ha atravesado profundas transformaciones, en consonancia con los cambios que, a lo largo de la historia, se han producido en las relaciones sociales. Dentro de estas grandes etapas históricas, la aparición de la ingeniería genética, en el siglo XX, marcó un antes y un después en la relación entre el hombre y la naturaleza, así como en los entramados entre ciencia y cultura, y en las relaciones entre ciencia y mercado (Palladino, 2002).

Entre 1943 y1961, un programa de investigación agrícola y asistencia técnica desarrollado por los Estados Unidos fue puesto en marcha en México. Con él se originó el paquete tecnológico de la llamada revolución verde, que sería exportado a América Latina, Asia e India, con un profundo impacto tanto en los rendimientos de algunos de los principales cultivos, como en las distintas estructuras sociales

agrarias. El término "Revolución Verde" fue utilizado por primera vez en 1968 por el ex director de la *United States Agency for International Development* (USAID), William Gaud, quien destacó que la difusión de las nuevas tecnologías "y otros desarrollos en el campo de la agricultura contienen los ingredientes de una nueva revolución. No es una violenta revolución roja como la de los soviéticos, ni es una revolución blanca como la del Sha de Irán. Yo la llamo la revolución verde." Estudios como el de Fitzgerald (1986) han señalado que los programas iniciales fueron exitosos en las regiones mexicanas en las que las condiciones ambientales y socio-económicas eran similares a las del agro estadounidense. Así, mientras que la obtención y difusión de nuevos trigos fue exitosa, no ocurrió lo mismo con los maíces híbridos, compatibles con los *farmers* y con un agro capital intensivo pero no con la agricultura de subsistencia del campesinado mexicano (Fitzgerald, 1986). El modelo de investigación y extensión rural propagado desde el Centro Internacional de Mejoramiento en Maíz y Trigo (CIMMYT) tuvo una gran impronta en la agricultura a nivel mundial. Su difusión implicó una transformación radical de la agricultura, dominada por la mecanización y la generación de semillas genéticamente modificadas de alto rendimiento, unidas a un paquete de fertilizantes, pesticidas y herbicidas. Estos cambios estuvieron acompañados por la expansión a nivel mundial de la industria química, bioquímica y farmacológica. Diversos autores han analizado críticamente el fenómeno. Entre los puntos señalados, se ha hecho hincapié en que con el argumento de contrarrestar las hambrunas en distintas regiones, la modernización tecnológica del agro tuvo como contrapartida la aparición de fuertes transformaciones sociales, económicas y ambientales (Pengue, 2005). También se ha señalado que fue convergente a la movilidad de capitales -en ascenso luego de la caída de Bretton Woods- que fomentó el accionar de grandes firmas, empresas trasnacionales, laboratorios químicos, semilleras y comercializadoras exportadoras, que pasaron a controlar la mayor parte del mercado agrícola internacional (Teubal, 2001). En este escenario, el uso de insumos externos que conformó el paquete tecnológico (agroquímicos, semillas mejoradas y renovadas técnicas de irrigación) se incrementó notablemente (Perelmuter, 2011). En Argentina, el INTA fue un activo introductor de los "trigos mexicanos", que fueron cruzados con variedades locales, y en la producción propia de híbridos de maíz.

A nivel internacional, distintos analistas de la ciencia ubican en la década de 1970 el avance hacia la privatización de la ciencia y la tecnología (Pestre, 2005). Para la década de 1980, en Estados Unidos, dos relevantes transformaciones del marco regulatorio de la actividad de CyT se vincularon a esta problemática. El Acta de Transferencia de Tecnología de Stevenson-Wydler, que facilitó los convenios entre laboratorios públicos, universidades y empresas, y la Enmienda Bayh-Dole a las leyes de patentes, que otorgó a las universidades y centros de investigación la posibilidad de percibir derechos de propiedad intelectual por trabajos realizados con fondos públicos (Krimsky, 1991). Durante este período, estas tendencias internacionales en la producción científica en Argentina se combinaron con un modelo económico aperturista, y con una fuerte concentración de capital en el agro protagonizada por empresas transnacionales semilleras y agroquímicas. La escala tecnológica y económica requerida para los nuevos paquetes tecnológicos (semillas + agroquímicos) relegó al país al rol de receptores de esas tecnologías (Bisang y Varela, 2006). Sin embargo, en algunos nichos de investigación agrícola, como lo es el caso estudiado en este artículo, el Estado mantendría posiciones de liderazgo internacional. Mientras que, a lo largo de la década de 1960, las investigaciones oficiales apuntalaron la consolidación de la industria semillera local (sin ningún tipo de retorno por la utilización de las investigaciones), en el nuevo escenario los conocimientos generados se articularon a un escenario transnacional. El fin de los ´80, en plena crisis inflacionaria, vio nacer los "Convenios de Vinculación Tecnológica" (CVT) con empresas. El pionero fue el INTA. En este sentido, la articulación analizada, entre la empresa BASF y el INTA, fue realizada utilizando esta figura de la política de vinculación tecnológica vigente, que el organismo inauguró oficialmente en 1987. Mediante estos convenios estableció acuerdos con el sector privado, que a cambio de financiar parte de las investigaciones, accedió en forma explícita a la utilización comercial de los resultados. Estos "desarrollos conjuntos" le sirvieron al INTA para garantizar su supervivencia durante el brutal recorte al presupuesto registrado en la década de 1990, y formalizaron una relación que, en los hechos, ya estaba desplegándose.

En un estudio previo, centrado en la producción de híbridos de maíz en Argentina, indicamos la existencia de un ciclo histórico de apropiación privada de conocimientos generados con fondos públicos, por parte de un sector concentrado del sector semillero, y señalamos la existencia de tres hitos relevantes en el marco regulatorio (Gárgano, 2016). El primero, durante la década de 1960, en el momento de conformación de la industria semillera local, cuando una disposición de la Secretaría y Agricultura estableció en 1959 el secreto comercial de los híbridos del sector privado (el *pedigree* cerrado), mientras que obligó a que los híbridos del sector público mantuvieran disponible la información de sus fórmulas (*pedigree* abierto), sin percepción de regalías, generando que los híbridos de la naciente industria semillera fueran registrados como propios a partir de las investigaciones realizadas en el sector oficial. El segundo, en 1979, cuando en tiempos de la intervención del INTA en el marco de la última dictadura militar (1976-1983), una resolución del organismo dictaminó la cesión de sus recursos fitogenéticos a los criaderos privados. Y, el tercero, poco antes de iniciar la década de 1990, con la implementación de los CVT. El presente estudio, centrado en una investigación reciente, permite identificar la continuidad y vigencia de esta tendencia de direccionamiento de los resultados de las investigaciones en semillas realizadas con fondos públicos.

Cabe precisar que dentro de la producción científica y tecnológica estas tendencias no son privativas del INTA. Al contrario, se condicen con las pautas explícitas e implícitas de buena parte de las instituciones y marcos regulatorios locales. Al mismo tiempo, el protagonismo de firmas como BASF en los convenios de vinculación tecnológica, tampoco es una singularidad de la investigación local, ni de los patrones de producción vigentes en el espacio rural argentino. El crecimiento del agronegocio ha coincidido con una fuerte concentración, de la que

BASF es parte junto a un selecto grupo de firmas. Para el año 2015, solamente tres empresas (Monsanto, Dupont y Syngenta) controlaban el 55% del mercado mundial de semillas, mientras que seis (Bayer, Monsanto, Dupont, Dow, Basf y Syngenta), dominaban el 75% del mercado de agroquímicos (Ribeiro, 2001). A este panorama se le ha añadido la fusión, producida en septiembre de 2016, entre Bayer y Monsanto, protagonizada por la primera. El 65,4% de la producción de agroquímicos permanece actualmente concentrada en tres empresas, ChemChina-Syngenta (25,8 %), Bayer-Monsanto (24,6%) y DuPont-Dow (15%). En el área de semillas, el 60,7 % del mercado queda a cargo de las mismas firmas: Bayer-Monsanto (30,1%), DuPont-Dow (22,7) y ChemChina-Syngenta (7,9%). En este marco de progresiva concentración horizontal y vertical, se multiplica la utilización de germoplasma proveniente del sur. En simultáneo, las nuevas leyes de semillas impulsadas en distintos países de la región amenazan con poner fin a las exenciones a los agricultores, el histórico "uso propio", y a los investigadores, los intercambios no lucrativos con fines de investigación, ambas contempladas en las legislaciones vigentes. En este proceso, el derecho de "participar en el progreso científico y en los beneficios que de él se derivan", incorporado en las declaraciones universales de DDHH (Ribeiro, 2001, p. 363), está tan lejos de ser alcanzado como lo está el replanteo de las condiciones de producción en el espacio rural.

Los modelos extractivistas se han articulado en base a un binomio constituido entre los poderes financieros transnacionales y los gobiernos locales, que ha dado como resultado un patrón concentrador y excluyente, con altos costos sociales y ambientales (Manzanal, 2012). En este sentido, es posible señalar una articulación entre la acumulación por desposesión que describe David Harvey (2004) y el "consenso de las commodities" señalado por Maristella Svampa (2013), en la que, junto a la explotación de la naturaleza, la dimensión cognitiva juega un rol singular. En articulación con estas dinámicas, se evidencia la transformación de bienes comunes naturales en commodities agrícolas y también el carácter conocimiento intensivo de estas mercancías agrarias. Así, esta acumulación por desposesión incluye también a la producción local de conocimiento. Y, en rigor, en el plano analizado, cabe revisar la categoría de "desposesión", ya que lo encontramos en una cesión, legalmente regulada e impulsada por el Estado.

4. Conclusiones (o ciencia para qué y para quiénes)

Actualmente, las tres tecnologías dirigidas a lograr variedades de arroz resistentes a herbicidas involucran a grandes empresas transnacionales. El INTA argentino, en un desarrollo pionero, obtuvo nuevas variedades que se están difundiendo en América, Asia y Europa. Argentina es también el octavo productor mundial de arroz, el cultivo comestible más importante del mundo. Como se ha reconstruido, el proceso de investigación y obtención de estos resultados involucra a una de las principales firmas transnacionales del concentrado mercado semillero y agroquímico, BASF. El caso estudiado expone las tensiones existentes entre la conceptualización de las semillas como bienes comunes, pilares en la reproducción de la humanidad, y su transformación en mercancías. Y muestra cómo, en este proceso histórico, la mercantilización del conocimiento científico asociado a la obtención de nuevas variedades posee relevantes derivaciones.

Sheldon Krimsky (1991) ha caracterizado como "capitalismo académico" a los patrones de producción de conocimiento que proliferaron como consecuencia de la imbricación creciente entre universidades y empresas. En rigor, la definición excede al ámbito universitario. En Argentina, esta problemática es indivisible de su matriz de productiva, por lo que los conocimientos vinculados a la producción agrícola juegan un rol primordial. En el convenio de vinculación analizado entre el INTA y la firma BASF, el beneficio institucional redunda en el reconocimiento internacional de la genética de arroz desarrollada por el organismo, y en la obtención de regalías, (magras en comparación con las ganancias millonarias derivadas de la comercialización de las variedades a nivel mundial), para seguir trabajando en el programa de mejoramiento. En este sentido, cabe preguntarnos, ¿es ésta la única posibilidad de direccionamiento (y por lo tanto de apropiación) del conocimiento científico y tecnológico generado en el ámbito público? Junto al prestigio internacional que logran de este modo las investigaciones, ¿no sería deseable retener en la misma esfera pública que ha sostenido por años las investigaciones y proporcionado la materia prima (el conocimiento) para la obtención de las variedades comerciales? No casualmente los dos centros a la vanguardia a nivel mundial en esta área son organismos estatales, de donde proviene el grueso de las inversiones. Aun considerando que en Argentina los períodos de ajuste presupuestario impulsaron que la continuidad de los programas descansara en los aportes de socios privados, sería necesario no solamente que ésta estuviera garantizada desde el sector público, sino que además, y en forma primordial, las prioridades de las agendas de investigación respondiesen a las necesidades de las poblaciones involucradas. ¿Cuánta utilidad les reportan a las comunidades rurales los convenios de vinculación con firmas transnacionales, que generan semillas genéticamente modificadas para ser resistentes a los herbicidas que estas mismas empresas producen? Esta ecuación resulta inviable mientras las propias comunidades no sean incorporadas al esquema, binario y al mismo tiempo en permanente retroalimentación, falazmente denominado "público-privado". Al mismo tiempo, ¿en qué medida el Estado argentino es capaz de recaudar fondos derivados de las investigaciones agrícolas que promueve para incorporarlos al gasto público en general y a los agricultores en particular? Tampoco esta pregunta tiene una respuesta posible mientras la agenda continúe definida en función de los requerimientos de las grandes corporaciones.

La ausencia histórica de políticas agropecuarias que promuevan emprendimientos para otorgar una continuidad al conocimiento producido en el ámbito público, a través por ejemplo de un organismo como el INTA, aparece también como un desafío pendiente. Y aún más, el modo en el que se definen los contenidos y las prioridades de las investigaciones. En este sentido, si el Estado, además de garante de un orden social, es considerado como una arena en disputa (De Sousa Santos, 2006), el ámbito de producción científica no debería ser dejado fuera de la agenda de preocupaciones a la hora de discutir una agricultura alternativa a los actuales modelos de explotación del suelo y expulsión de los pobladores del campo. Por un lado, por los patrones culturales, económicos y políticos que han atravesado los programas de investigación en fitomejoramiento impulsados en América Latina desde la revolución verde. Por otro, porque el direccionamiento y construcción de las agendas de investigación y extensión rural

es también un terreno en disputa. Al fin y al cabo, la ciencia es una construcción colectiva y tanto el proceso social de creación de conocimiento como su potencialidad se rompen cuando se subordinan a la lógica sustentada en la búsqueda de ganancia, que por definición se opone a la resolución de necesidades sociales. Repensar las formas de producción y de vida en el ámbito rural también requiere revertir la tendencia hacia apropiación privada del conocimiento orientado a la producción agrícola que es generado con fondos públicos.

Analizar críticamente la construcción de los contenidos y beneficiarios de los programas de investigación en semillas vigentes en Argentina implica, por un lado, reflexionar en torno a las posibles implicancias de estas problemáticas en la construcción de un modelo agrícola alternativo, que priorice la concepción de las semillas, y de los múltiples saberes asociados a ellas, como bienes comunes. Por otro, expone las implicaciones vigentes en la producción científica contemporánea. En este sentido, lejos de dirimirse en una polarización binaria entre una "ciencia hegemónica" -producida en las principales potencias mundiales- y una "ciencia periférica"- supeditada a esta primera y realizada en el denominado "tercer mundo" o bien en el heterogéneo conjunto englobado como "países en desarrollo"- encontramos una compleja trama que vincula ambos espacios en forma asimétrica pero promoviendo una misma ciencia empresarial, alejada de las necesidades de los territorios. En este proceso, las alianzas entre comunidades de investigación y empresas transnacionales exponen que es el Estado quien financia las rentas privadas (Dagnino, 2009). Resta analizar, en este sentido, los procesos de validación de los conocimientos generados incorporando tanto las tensiones entre diversas nociones de derechos (humanos, ambientales y de propiedad intelectual), como las derivadas de las presiones de la economía global. También se encuentra pendiente el análisis dentro la producción científico-tecnológica estudiada de los riesgos potenciales que implican al ambiente y a las poblaciones, y del rol de científicos y organismos estatales en su omisión.

Finalmente, este estudio de caso permite afirmar que la dimensión cognitiva es parte constitutiva de los modelos extractivistas y de las relaciones neocoloniales que los constituyen. La actual forma de organización de la producción de conocimiento científico y tecnológico en América Latina se encuentra atravesada por la configuración de sus matrices productivas. En este sentido, la intensificación del proceso de despojo y acumulación de capital a nivel mundial nos reserva a los países "periféricos" una tarea clara, histórica y renovada. Detrás de la llamada a que estos países apuntalen sus "sistemas nacionales de innovación" reaparece el mismo rol: la extracción creciente de bienes comunes naturales, acompañada cada vez más por la fuga de resultados de investigación. Más específicamente, de las ganancias derivadas de estos resultados. La semilla, patrimonio de la humanidad desde hace miles de años, no fue la única que se transformó en mercancía. Más lentamente, también lo hizo el propio conocimiento científico-tecnológico. En la Argentina del agronegocio, la ciencia empresarial juega un rol fundamental que necesitaremos revisar si queremos transformar las profundas asimetrías vigentes y construir nuevos modos de habitar, producir y vivir.

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Cecilia Gárgano es Doctora en Historia por la Universidad de Buenos Aires (UBA). Realizó su investigación doctoral y postdoctoral como becaria del Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), donde fue seleccionada como investigadora de la Carrera de Investigación Científica (CIC) en 2016. Profesora de la Escuela de Humanidades e investigadora del Centro de Estudios de Historia de la Ciencia y la Técnica "José Babini" (UNSAM). Integra el Grupo de Trabajo "Bienes Comunes" del Consejo Latinoamericano en Ciencias Sociales (CLACSO). Se dedica al análisis de la producción y apropiación de conocimiento científico orientado al agro, y a la historia reciente de la ciencia en Argentina. Desde el 2014 dirige un Proyecto INTA-CONICET, surgido de su tesis doctoral, y desde el 2016, el Proyecto PICT "Ciencia y Política en Argentina: producción pública de semillas y apropiación privada de conocimiento" financiado por la Agencia Nacional de Promoción Científica y tecnológica (ANPCyT).

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