JOURNAL OF TECHNOLOGY MANAGEMENT & INNOVATION

ISSUE 2 | VOLUME 12 | 2017

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UNIVERSIDAD ALBERTO HURTADO
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ISSN: 0718-2724. (http://jotmi.org)

User's Perspective of Eletronic Government Adoption in Brazil

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Abstract: The objective of this work was to study which factors influence the use of e-government in Brazil, focusing on investigating government computerization initiatives of fiscal control mechanisms, through a study on the Nota Fiscal Paulista program. We interviewed approximately 3,500 citizens who have used the program, in 11 cities in the State of São Paulo. Of this total, 715 responses were considered valid. We used a quantitative methodology for the development of this research, through the multivariate analysis technique of structural equation modeling. The study presented a robust model with a high explanatory power, in which the influencing factors are: Perceived Benefit; Perceived Ease of Use; Social Influence; Perceived Security; Trust in the Government and Habit.

Keywords: e-Government; technology adoption; information technology; Brazil.

Submitted: July 5th 2015 / Approved: Jun 14th 2016

Introduction

Information and communication technology (ICT) permeates human actions, observing effects of this presence in various social segments. The fast ICT development, especially the Internet and its appropriation by the people have caused substantial changes in organizations and work, changing and transforming the socioeconomic order (education, industry, trade, tourism, telecommunications etc). Currently, companies invest about 7.6% of their revenue in information technology (IT), a value which has tripled in the last 18 years (Meirelles, 2016). This intensive IT use in all sectors has also spread in the Public Administration, becoming indispensable in this area. The use of IT combined with the internet as a public management tool is called e-government/e-Gov and aims to better qualify the provision of services (e-Service) and maximize the Public Administration efficiency (e-Administration), enabling citizens to a so desired more effective participation (e-Democracy) in the political process.

According to Shareef, Kumar, Kumar and Dwivedi (2011), concepts and theories on e-government are in a definition process, as it is a recent area of study, still in development. Considered essential element in improving public management, e-Gov has different stages and models in different countries, with a common guideline the provision of good services to citizens (United Nations, 2010). The movement originated due to the growing development and popularization of technologies highlights the need for understanding the adoption of both products and services they provide. This understanding would allow the governments to implement benefits to society through public policies of inclusion and services for the citizens' quality of life. At the same time, the individuals would accept and use of such technologies (Goodhue, 2007).

In the e-Government concept, IT is a tool by which, through e-Services, citizen and state interaction occurs. We can infer that e-Gov implementation is linked to the citizens' desire (Evans & Yen, 2005; Shareef, Kumar, Kumar, & Dwivedi, 2009, 2011), with its accession depending on its acceptance, dissemination and success of propositions and policies inherent to e-Gov. There are several studies in different countries studying the e-Gov adoption, as in Canada (Shareef et al., 2011), in the United States (Carter & Bélanger, 2005), in Netherlands (Horst, Kuttschreuter, & Gutteling, 2007), in Singapore (Fu, Farn, & Chao, 2006), In Romania (Colesca & Liliana, 2008), in Turkey (Ozkan & Kanat, 2011), among others. Those studies have shown different results; however, all the suggested models are based or adapted from current acceptance technology theories, such as the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT). The models differences indicate a generalization difficulty from one context to another, due to cultural differences and different stages of the e-Gov development in the countries. Therefore, studying and researching the users' resistance and adhesion of e-Gov technologies in Brazil is an opportunity to collaborate on a model development for the country's reality, and identifying its factors can enable its administration more effectively, increasing opportunities for positive results. Thus, the objective of this work was to study what factors influence the use of e-government in Brazil, focusing on investigating government computerization initiatives of fiscal control mechanisms, through a study on the Nota Fiscal Paulista program.

2. Theoretical Framework

2. 1 Models of technological adoption

Contemporary theorists have examined the study of people's acceptance and adoption of technology, proposing theoretical models based on social psychology; the diversity of such models lies on determinants for such adoption. In order to explain and increase the acceptance of individuals with regard to the technologies, it is necessary to understand the reasons that lead them to adopt or reject IT (Davis, 1989).

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ISSN: 0718-2724. (http://jotmi.org)

Models intending to predict the acceptance and use of technology emerged with Davis (1989) and the Technology Acceptance Model (TAM). Starting from the TAM model, several other researchers conducted studies, deepening the knowledge of acceptance and technological adoption in some areas of knowledge related to information technology.

The more highlighted article of technological adoption belongs to Venkatesh et al. (2003), which feature one of the most widespread models in the IT literature. Venkatesh et al., (2003) suggested a model with eight prominent models in the area and empirically compare their dimensions, seeking convergence to its integrated model, named Unified Theory of Acceptance and Use of Technology (UTAUT). Venkatesh's model was presented as a way for administrators to assess the success probability of new technologies introduction, assisting in understanding the initiative.

This Venkatesh et al., (2003) unified model led to significant progress in understanding adoption and use of technology, although its focus has been primarily on individual processes of psychological level and contingencies that arise as related technology perceptions and situational factors, respectively (Venkatesh et al., 2003). UTAUT was initially developed for organizational context. Some years later, Venkatesh, Thong and Xu (2012) developed the UTAUT2, extending the acceptance model and use of technology to the consumer context.

2. 2 Adoption of e-services

E-service is defined as services that are offered, provided and/or consumed by the internet (Swid & ElMelegy, 2012). E-services include processes, policies, procedures, personnel, tools and technologies that enable companies to provide customer service using the Internet as a platform (Featherman & Fuller, 2003). These e-services are offered to consumers, not only to provide better customer service, but also to download the labor-intensive activities from the provider to the consumer (Featherman & Fuller, 2003; Moraes, Meirelles, & Cappellozza, 2016).

The adoption of e-service differs from what occurs with basic shopping in e-commerce in terms of complexity and long-term relationship between the consumer and the service providers. The adoption and use of e-services depend on many factors such as utility and ease of use perception, inherent risk concerns and trust (Hoffman et al., 1995).

Consumers are hesitant to try new e-services for several reasons. However, an obstacle often cited is the fear of the possible negative consequences related to the use of the Internet as a means of transaction (Jarvenpaa & Tractinsky, 1999). Consumers' concerns about the dangers and uncertainties have been mentioned in the literature as Perceived Risk and Perceived Security. While Perceived Risk is an inhibitor to purchase products and services adoption, including information systems (IS), Perceived Security is an influencer.

Trust is also a determining factor in the users' perception, affecting the adoption and use of electronic services. In developed countries, adopting e-services has greatly increased; however, in developing countries the rate of adoption has yet to evolve, lacking more research (Swid & ElMelegy, 2012; Moraes, Meirelles, & Cappellozza, 2016). When the citizen gets interested on e-service, the propensity to use increases. However, when consumers realize that there is a risk to buy a product or use a service, there are marked changes in their behavior. Researches in e-services have adopted similar strategies to research strategies in IT adoption. As subsidy, they use adoption models such as TAM, and complement with factors inherent to services.

2. 3 E-Gov in Brazil

The use of information by the Brazilian government is prior to the 1950s, but the use of the term e-Government is from 1996, with e-services provided by the Brazilian federal government (Ferrer & Santos, 2004). Services such as the delivery of the income tax declaration, information on social security and government procurement are available on the Internet since 1998, and in 2000 was defined and established the Electronic Government Policy and the launch of the Society Program information, consolidating and spreading e-government and the social importance of digital inclusion strategies, as well as actions related to information technology in the country, deploying through structures and legal guidelines the e-government in the country (Ferrer & Santos, 2004).

Scholars of e-Gov in Brazil could prove the e-government program success until 2003, transition of the federal government, when its program was no longer a priority, because of four factors identified by Pinto and Fernandes (2005):

- Change in political leadership, with different involvement of new employees;
- Absence of inter-bureaucratic coordination, with no longer program responsible subjects in several Ministries;
- Problems in connecting with the society, causing discontinuity in partnerships and companies that provide technological services;
- Lack of resources for the e-Gov program, subsisting projects of specific sectors, yet isolated from an aligned policy development.

Such factors may have interfered for the fact that Brazil, which in 2005 was classified on the 33rd position, went for the 45th place in the UN world ranking of e-Gov, in 2008. In a 2010 survey, Brazil placed 65th position, meaning that in five years the Brazilian e-Gov accumulated loss of 32 positions (United Nations, 2010).

Despite this noticeable decline, Brazil stands out in specific initiatives such as the Open Government and Open Data, mentioned in the UN report as an example of good practices for having a single goal of access to public data. The online service insufficiency and poor telecommunications infrastructure are indicated in that report as the main causes for the Brazilian classification.

Currently, the Brazilian government offers to citizens several e-Gov systems. Among the most important are:

a) IRS – income tax collection services; taxpayer's fiscal status; social security and national register of legal entities registration; statements; among others.

b) Federal Police – services such as passport application; statements of criminal records; support for international adoptions; among others.

c) Integrated System of Financial Administration of the Federal Government (SIAFI, in Portuguese) – interests linked to the national treasury, as availability of public spending.

e) Poupa Tempo (a state of São Paulo program) – access to public service information, such as documents request and opening and closing a business.

f) OntoJuris Project – providing legislation information in intellectual property, consumer rights and electronic rights.

g) Public Digital Bookkeeping System (SPED, in Portuguese) – tax information, rationalization and standardization of ancillary obligations to taxpayers.

h) Compras Net – shopping website of the federal government, with equivalents websites in most states and in many municipalities.

2.4 Nota Fiscal Paulista program

To understand the adoption of e-government in Brazil, the Nota Fiscal Paulista program (NFP) was chosen; it is a pioneering initiative developed in the state of São Paulo and is gradually being replicated to the rest of the country.

The e-Government program in São Paulo began in 1995 when the state government took over its management, with the objective to stimulate and implement the modernization of Public Administration. The program involved all State Departments, put together the governmental structure and heads of various levels, in a collective effort. The Nota Fical Paulista program (NFP) had its beginning on October 1, 2007, as part of the Stimulus Program for Fiscal Citizenship of the State of São Paulo; it is a specific program of this state, with the support of Law 12685/2007 and Decree 52096/2007 and 54179/2009. The program is part of the context of electronic information exchange between the Tax Authorities and taxpayers and use of the Internet as a service platform. Typified as citizenship fiscal action, NFP aims at: encouraging consumer of goods; intermunicipal and interstate goods and transport services to require the tax document; reducing informal and illegal products trade and combat tax evasion. Its origin occurred in a similar program implemented in 2006 in the City of São Paulo, named Tax Invoice of Electronic Services (NFS-e, in Portuguese), which provides credits to discount up to 50% in property tax for consumers who inform their social security in the tax invoice.

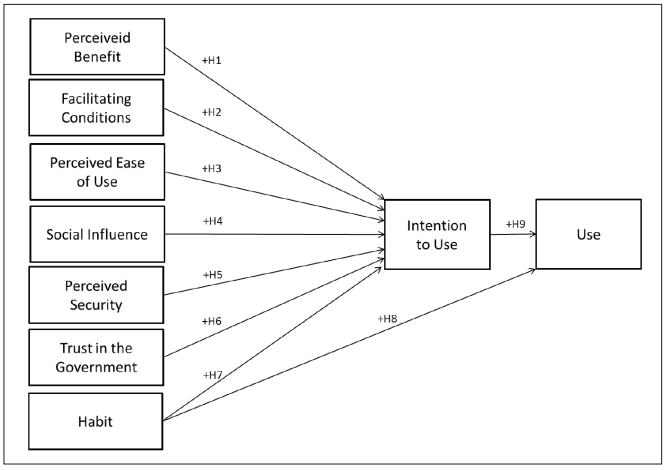
In the NFS-e program, the individual consumer receives 30% of the Service Tax (ISS, in Portuguese) collected by the service provider. That is, for each tax invoice, the consumers are entitled to 30% of their collected Service Tax until the beginning of next month.

The NFP implementation was progressive and industry adoption has become mandatory through a plan that occurred from October 2007 to September 2009, according to the NCEA – National Code of Economic Activity – of the market. The digital inclusion issue of the lower classes was treated and operated by Program Access São Paulo, which provides access to the Internet and its services, currently with 629 public places and 3,400 machines. The operation of the incentive is as follows: the consumer signs up on the program's website and at every purchase informs the social security or national register of legal entities to issue the invoice, getting reduction in the tax burden; the consumer can also not identify the social security number, donating the tax vouchers for social assistance entities or healthcare, they will receive the credit of that purchase; the registered and identified consumer can earn prizes, sponsored by the Department of Finance.

3 Proposed Model

According to the literature review, we developed a model which best served the purpose of this study (Figure 1), which aims to identify what are the elements that determine the adoption of e-government in Brazil. To Whetten (1989), the visual representation facilitates the theoretical model understanding.

Figure 1. Conceptual model of research



Models presented many generalization difficulties, due to cultural differences, e-government deployment phases and economic development of the countries. Thus, we decided to develop a model according to the Brazilian context.The proposed model was based on the theories of IT adoption, e-service adoption models, e-commerce and e-Gov. Table 1 shows the explanation of the constructs.

Table 1: Constructs

Constructs	Definition
Perceived Benefit	Benefits in terms of financial aspects, accessibility, availability, comfort in use, saving time, convenience, and also social aspects, in which the individual works with the society and the government, being aware that the requirement of the invoice should bring greater revenue for the state and possible improvements for the citizens.
Facilitating Conditions	They consider the ease of computer access, internet and governmental infrastructure (call centers and cyber cafes, for example).
Perceived Ease of Use	It indicates that e-government initiatives should not be adopted if the citizen has no ability to use the technology to access the necessary information available.
Social Influence	It is the degree to which the individual considers important if others believe he/she should use a new system; the opinion importance of people who influence the individual's behavior
Perceived Security	It is linked to the consumer protection from any kind of risk, financial or otherwise, during transactions on websites, for example, any risk of identity theft and citizen confidential information.
Trust in the Government	It is related to the degree of citizens' trust in the government. It assures that the information provided is not used against their interests in other sectors (for example, a cross-check with the IRS) or provided or sold to private companies.
Habit	It is defined as the extent to which people tend to behave automatically because of learning. Thus, citizens who are used to require the NFP tend to increase the Intention to Use and effective program Use.

Table 1. Explanation of the constructs.

Table 2: summarizes the hypotheses of this study, with their theoretical bases.

Hypo-thesis	Description	Theoretical Basis
H1	Perceived Benefit positively influences the NFP Intention to Use	Horst et al., (2007); Shareef et al., (2011); Venkatesh et al., (2012).
H2	Facilitating Conditions positively influence the NFP Intention to Use	Venkatesh et al., (2003); AlAwadhi and Morris (2008); Venkatesh et al., (2012).
H3	Perceived Ease of Use positively influences the NFP Intention to Use	Davis (1989); Carter and Bélanger (2005); Hung et al., (2006); Colesca and Liliana (2008); Shareef et al., (2009); Shareef et al., (2010).
H4	Social Influence positively affect the NFP Intention to Use	Venkatesh et al., (2003); AlAwadhi and Morris (2008); Venkatesh et al., (2012).
H5	Perceived Security positively influences the NFP Intention to Use	Suh and Han (2003); Shareef et al., (2009); Özgüven (2011); Shin and Shin (2011).
H6	Trust in the Government positively influences the NFP Intention to Use	Horst et al., (2007); Colesca and Liliana (2008); AlShafi and Weerakkody (2008); Shareef et al., (2009); Ozkan and Kanat (2011).
H7	Habit positively influences the NFP Intention to Use	Limayem et al., (2007); Venkatesh et al., (2012).
H8	Habit positively influences the NFP Use)	Venkatesh et al., (2012).
H9	Intention to Use positively influences the NFP Use	Venkatesh et al., (2003); Venkatesh et al., (2012).

Table 2. Study hypotheses

4 Methodological Aspects

For the development of this research we used the quantitative methodology, through multivariate data analysis. Given the characteristics of this research, in which theories on adoption of e-government are poorly developed, the objectives are prediction and explanation of the proposed constructs, and as the structural model is complex, we chose to use the Partial Least Squares Path Modeling (PLS-SEM), according to Hair, Hult, Ringle and Sarstedt (2013) suggestions.

We conducted interviews with citizens to obtain data for use of PLS-SEM, using a survey for data collection, based on Heeks and Bailur (2007) suggestions about e-Gov research. The preliminary questionnaire was validated by a group composed of nine specialists, including: academics who study e-Gov; academics who study technological adoption models and managers directly involved in e-government programs. The scales were adapted from previous studies.

We interviewed about 3,500 citizens who have used the Nota Fical Paulista program. Of this total, 715 responses were considered valid. To verify if the sample size was adequate, we performed the test through the G*Power 3.1 software (Faul, Erdfelder, Buchner, & Lang, 2009), which is a statistical analysis program commonly used in social, behavioral and biomedical sciences. We performed post hoc analysis test (Cohen, 1988) to verify the probability of rejecting H0 when it is not true (1–β). Placing the values of this study in the G*Power 3 software, with the effect size (f2) of 0.10, we obtained as a result 0.99 for the power test (1–β), a value considered appropriate for sample size.

To sample stratification definition, we opted for the use of Municipalities Participation Index. The indicator represents a percentage indication to be applied to 25% of the amount of the Tax on Circulation of Goods and Services for Interstate and Intercity Transportation and Communication collection (ICMS, in Portuguese) and allows the State to deliver the shares of the municipalities relating to income tax. Thus, we understand that the municipalities with the highest revenues are those that emit greater amount of tax invoice, and possibly present greater use of the NFP. Therefore, the survey was conducted in 11 cities in the State of São Paulo with the highest rates, using the average index of the last six years to define the amount of interviews in each city, according to Table 3.

CITY		AVERAGE INDEX	%	INTERVIEWS
1	SÃO PAULO	23,20	50,17%	351
2	GUARULHOS	3,53	7,63%	53
3	SÃO BERNARDO DO CAMPO	3,48	7,52%	50
4	PAULÍNIA	2,73	5,90%	39
5	CAMPINAS	2,67	5,77%	42
6	SÃO JOSÉ DOS CAMPOS	2,46	5,32%	38
7	BARUERI	2,42	5,23%	35
8	JUNDIAÍ	1,59	3,45%	27
9	SOROCABA	1,44	3,12%	25
10	OSASCO	1,37	2,96%	28
11	RIBEIRÃO PRETO	1,36	2,93%	27
TOTAL		-	100,00%	715

Table 3. Number of interviews by municipality

All questions were measured using a Likert scale of seven points, as occurred in studies that used similar models to IT adoption. The interviewees answered with variations between the extremes "Strongly Disagree" until "Strongly Agree". The questions were in random order in the questionnaire.

For calculation and validation of statistical tests, developed by multivariate analysis technique of structural equation modeling, we used the softwares SmartPLS 2.0.M3 (Ringle, Wende, & Will, 2005) and Minitab 14.

5 Descriptions and Analysis of Results

According to Hair et al., (2013), the evaluation criteria of reflective measurement models are:

- Internal consistency (composite reliability);
- Reliability of the indicator;
- Convergent validity (average variance extracted);
- Discriminant Validity.

To examine the convergent and discriminant validity of the constructs used in the structural model we performed the Confirmatory Factor Analysis (Hair et al., 2005). All constructs showed indicators with high loads in their latent variables, above 0.70, and low loads in the other latent variables, indicating reasonable discriminant and convergent validity (Chin, 1998). The only indicator which does not have a value exceeding 0.70 is USO4, which has the value 0.697, very close to the acceptable. For the model convergent validity, another indicator used is the average variance extracted (AVE) value that, as a criterion for validation, should have a value greater than 0.5 (Hair et al., 2013).

A key measure used to assess the measurement model, in addition to the tests for each indicator, is the composite reliability of each construct (Hair et al., 2005; Hair et al., 2013). The composite reliability describes the degree to which the indicators represent the latent construct in common. A standard commonly used for acceptable trust is 0.70.

Checking the internal consistency was another indicator used to analyze the convergent validity. A high internal consistency value in the construct indicates that all variables represent the same latent construct. The internal consistency is evaluated by means of the Cronbach's alpha, ranging from 0 to 1, with higher values, indicating a high consistency level. For exploratory studies, values between 0.60 and 0.70 are considered acceptable; for studies in more advanced stages, values between 0.70 and 0.90 are considered satisfactory (Hair et al., 2013). Table 4 shows all the mentioned indicators.

Values of all indicators are within the established by the authors, with the exception of the internal consistency value for the Facilitating Conditions indicator, presenting values below appropriate. According to Hair et al., (2013) Cronbach's alpha is sensitive to the number of items in the scale, and usually tends to underestimate the internal consistency; therefore it is more appropriate the composite reliability evaluation, in which the indicator showed appropriate values.

The indicators analysis of the significance was carried out with the values calculated by the bootstrapping technique (Efron & Tibshirani, 1998). The use of bootstrapping technique to analyze the loads significance obtained for the observable variables is not based only on one model estimation; nevertheless it calculates parameter estimates and their confidence intervals based on multiple estimates (Hair, Anderson, Tatham, & Black, 2005; Hair, Hult, Ringle, & Sarstedt, 2013).

	PB	FC	TGOV	PEOU	HAB	INT	SI	PS	USE
PB	**0,791**								
FC	0,398	**0,725**							
TGOV	0,558	0,375	**0,826**						
PEOU	0,394	0,505	0,351	**0,777**					
HAB	0,564	0,271	0,346	0,311	**0,821**				
INT	0,620	0,400	0,490	0,463	0,608	**0,839**			
SI	0,521	0,418	0,431	0,311	0,391	0,475	**0,789**		
PS	0,454	0,531	0,573	0,538	0,357	0,507	0,442	**0,826**	
USE	0,458	0,428	0,278	0,447	0,658	0,706	0,430	0,477	**0,783**
AVE	0,626	0,525	0,682	0,604	0,674	0,704	0,622	0,682	0,613
Composite reliability	0,833	0,768	0,866	0,859	0,892	0,905	0,868	0,864	0,863
Cronbachs Alpha	0,702	0,549	0,767	0,780	0,839	0,859	0,796	0,767	0,788

Table 4. Synthesis of evaluation of measurement models

In this research there was a resampling of 5,000 samples, with replacement of 715 cases, according to Hair et al., (2013) recommendations. Thus, Student's t statistics analyzes the hypothesis that the correlation coefficients are equal to zero. If the results of this test show values higher than 1.96, the hypothesis is rejected and the correlation is significant (Efron & Tibshirani, 1998; Hair et al., 2013).

Table 5 presents the coefficients values between the constructs and their respective Student's t statistics. The values were estimated by the bootstrapping technique. All relation values, except for Facilitating Conditions regarding Intention to Use, presented Student's t values higher than 1.96 (significance level = 5%). The t test value for Facilitating Conditions with Intention to Use was 0.79, with a p-value of 0.43. This value means that the Facilitating Conditions construct does no influence on the Intent for Adoption of the NFP, not confirming the Hypothesis 2.

Relation between Constructs	Strutural coefficient (Average)	Standatd deviation	T test	*p-value* (two-tailed)
Perceived Benefits -> Intention to Use	0,22	0,05	4,33	0,00
Facilitating Conditions -> Intention to Use	0,03	0,02	0,79	0,43
Trust -> Intention to Use	0,09	0,04	2,35	0,02
Perceived Ease of Use -> Intention to Use	0,14	0,04	3,58	0,00
Habit -> Intention to Use	0,33	0,05	6,73	0,00
Habit -> Uso	0,36	0,04	8,18	0,00
Intention to Use -> Uso	0,49	0,04	11,46	0,00
Social Influence -> Intention to Use	0,09	0,03	2,59	0,01
Perceived Security -> Intention to Use	0,11	0,04	2,52	0,01

Table 5. Structural model coefficients – between constructs

Figure 2 shows the resulting model with a synthesis of the hypotheses validation.

Analyzing the coefficient of determination (r^2), according to Cohen's scale (1977), the model has a high value for both Intention to Use as for the effective Use of the NFP, and the amounts are respectively 0.555 and 0.581. However, according to the scale of Hair, Hult, Ringle and Sarstedt (2013), the values are considered moderate, though adequate.

Figure 2. Synthesis of validation of hypotheses as the conceptual model
Obs.: NS=not significant ** p<0.05; * p<0.01

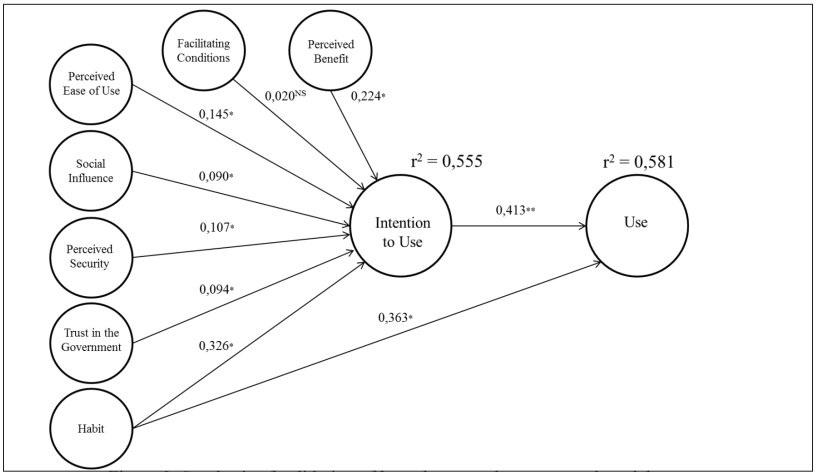


Table 6 presents a synthesis of the tests of this study hypothesis.

Hypothesis	DESCRIPTION	RESULT
H1	*Perceived benefit positively influences the NFP Intention to UsE*	**CONFIRMED**
H2	*Facilitating conditions positively influence the NFP Intention to UsE*	**NON-CONFIRMED**
H3	*Perceived Ease of Use positively influences the NFP Intention to Use*	**CONFIRMED**
H4	*Social influence positively affect the NFP Intention to Use*	**CONFIRMED**
H5	*Perceived Security positively influences the NFP Intention to Use*	**CONFIRMED**
H6	*Trust in the Government positively influences the NFP Intention to Use*	**CONFIRMED**
H7	*Habit positively influences the NFP Intention to Use*	**CONFIRMED**
H8	*Habit positively influences the NFP Use*	**CONFIRMED**
H9	*Intention to Use positively influences the NFP Use*	**CONFIRMED**

Table 6. Synthesis of tests of the hypothesis of this study

6. Conclusions

The study presented a robust model with a high explanatory power, in which the influencing factors are: Perceived Benefit; Perceived Ease of Use; Social Influence; Perceived Security; Trust in the Government and Habit.

The model is at the confluence of several other models developed by IT researchers related to individual use of technology; however, it has unique characteristics because it was developed in a still unexplored area.

The results contribute to IT researches, with a model that reinforces and extends previous studies on technological adoption (as theories UTAUT and UTAUT2), research in e-commerce and e-government, adding a model in a new context yet unexplored.

The existing models in the literature cannot represent all the dimensions addressed in the model presented in this study, because they do not take into account specific NFP program aspects.

According to the research, the main factor for Intention to Use is Habit, positively influencing the Intention to Use and directly influencing the Use. Thus, in the e-government context, the more citizens are accustomed to using the programs, the greater the intention of keep using them.

Perceived Benefit highlights as a second factor, also positively influencing the Intention to Use e-Gov. We consider benefits in terms of financial aspects, accessibility, availability, comfort in use, saving time, convenience, and also social aspects, in which the individual works with the society and the government, being aware that the

requirement of the invoice should bring greater revenue for the state and possible improvements for the citizens. The Perceived Ease of Use construct is the third most influential factor in the Intent of Adoption and concerns the ability to use technology to access necessary information available. Thus, the greater the ability of citizens to browse the website, access the account, check and use the NFP credits, the greater the intention to use the program. Perceived Security, Social Influence and Trust in Government greatly influence the Intention to Use the e-Gov. The Perceived Security influence shows the importance of practicing safety measures to ensure users' data confidentiality as well as minimize the fear of financial transactions over the Internet. In the case of e-government, Perceived Security can be understood as the extent to which the citizen believes that the use of the programs is free of risks.

Regarding Social Influence, we observed that people who are important in the citizen's social circle exert influence on the use of the e-Gov programs, with respect to initiatives for the computerization of fiscal control.

The Trust construct is related to citizens' trust in the government. In the case of NFP, trust in the government exerts a positive influence, which means that, in general, citizens are not afraid to provide information about their purchases, since they consider the credit reliable and they do not believe their tax data shall be used for other purposes.

The only construct that had no influence on Intention to Use was the Facilitating Conditions construct. The construct is related to technical knowledge on the use of the program, to the support availability and to the similarity with other operations already carried out by the user.

In relation to the effective Use of the NFP program, selected and tested factors were: Intention to Use and Habit. In this case, both constructs showed positive results and positively influence the Use of the program. In practical terms, the research assists in the citizens' participation and involvement in the current e-government development phase in Brazil, exposing users' perceptions. According to Olphert and Damodaran (2007), such participation is important in order to maximize the potential benefits for the government and for the citizens. Understanding the factors that positively influence the adoption of the Nota Fical Paulista program and clarifying this technology influence in users' personal and professional lives, it is possible to improve the quality of service to meet the society demands. Thus, it also allows an increase in the Brazilian e-Gov initiatives adoption.

The findings also support faster deployment of the program in other administrative contexts for e-Gov, generating useful information for the main points to be considered in order to increase citizens' use and the chances of successful implementation. Some author's suggestions regarding actions that government agencies interested in implementing or improving similar NFP fiscal controls initiatives are:

Enabling, stimulating and disseminating projects and places for use of internet in public places. The ability to use technology to access programs information influences the spread of the program. Therefore, it is necessary to offer possibilities and accessibility to users. Some examples are: free wireless internet available in public squares; creating public spaces offering the use of computers, with monitors to guidance; offering computer courses to the public; creating computer rooms in schools, among others;

Constantly dissemination of programs, explaining to the users the main advantages, as the credits offered, the state tax aspects as well as awards. The more citizens have the perception that the benefits are advantageous, the greater the intention to use the programs; Wider dissemination of the Program Access São Paulo and e-Poupatempo; Enhancing the benefits offered through user surveys, increasing the incentive to use. Thus, some examples are: awareness campaigns on the importance of asking the invoice; transparency with the amounts collected by taxes; improvement of credits offered and awards.

Adding and updating the program website security tools, to increase the perception of safety, especially when financial transactions for personal and corporate accounts are necessary; Conducting advertising campaigns (for example, with citizens using the program, award winners and opinion makers) to increase government credibility, increasing the intention of joining the program. The suggested actions can contribute to regular use or adoption of the program, contributing to habit formation. Therefore, the user can become a disseminator of the program, influencing, advising and approving others in the initiative.

Acknowledgments

This research was supported by: National Counsel of Technological and Scientific Development (CNPq), São Paulo Research Foundation (FAPESP) and Espaço da Escrita / Coordenadoria Geral da UNICAMP.

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Teams in Small Technology-Based Firms: The Roles of Diversity and Conflict Management

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Abstract: This paper explores the effect diversity and conflict management have on the relationship between teamwork and organizational performance in small technology-based firms. The study of the relationship between these variables has involved quantitative research, with the results of the survey on 107 small Brazilian high-tech firms showing that diversity and conflict management positively moderate the relationship between teamwork and organizational performance. This means that higher levels of diversity and conflict management lead to better organizational performance. At the same time, our findings indicate that conflict management is important regardless of the level of diversity within teams. This research sheds new light on the factors for rendering teamwork more effective in this specific context.

Keywords: teamwork; diversity; conflict management; technology-based firms; innovation.

Submitted: March 4th 2017 / Approved: July 30th 2017

1 Introduction

Technology-based firms commercially explore and develop technological innovations (Little, 1977). Their role in today's economy is so important that many governments are relying on them for long-term economic growth (World Bank, 2015). Teamwork is particularly relevant within the context of Small Technology-Based Firms (STBFs), as the complex and dynamic environment in which these firms operate requires employees at all levels to pool their knowledge, skills and abilities to tackle daily work challenges (Mintzberg, 1992; Riolli-Saltzman & Luthans, 2001; Kanovska & Tomaskova, 2012). Nevertheless, certain team characteristics need to be considered for teamwork to be effective (West, 2002; Riolli-Saltzman & Luthans, 2001; Klotz, Hmieleski, Bradley, & Busenitz, 2014).

While there is abundant research on the antecedents of effective teamwork within technology-based firms (e.g., Lechler, 2001; Hen-neke & Lüthje, 2007; Shrader & Siegel, 2007; Patzelt, Knyphausen-Aufseß, & Nikol, 2008; Boone & Hendriks, 2009; Jong, Song & Song, 2011; Ganotakis & Love, 2012; Nielsen & Nielsen, 2013; Qian, Cao & Takeuchi, 2013), it has focused mainly on the dynamics within entre-preneurial and top management teams. The archetypal team-based structure of STBFs, which is their usual approach to the organization of productive work around teams outside leadership and managerial levels, seems to have received only scant attention. Within STBFs, tea-mwork is indeed spread across all positions, involving almost every productive task (Mintzberg, 1992). This study therefore focuses on organizational-level teamwork, and it explores the role that two team facets may play in explaining the differentials in teamwork's contri-bution to business success. These characteristics are 1) team diversity, and 2) conflict management. In particular, we pose the following re-search question: What impact do team diversity and conflict mana-gement have on the relationship between the degree of teamwork and organizational performance within STBFs?

The degree of teamwork within STBFs is measured here as the proportion of employees involved in work teams. By team diversity we mean the level of knowledge and skill plurality that the members of a work team have in relation to the task they perform (Horwitz, 2005); while by conflict management we mean an approach whereby opposing views on an issue are leveraged to produce solutions shared by team members (West, 2002). Team diversity and conflict management are part of a set of key elements that are believed to be conducive to increased team and organizational performance (Qian *et al*, 2013).

All-in-all, from a theoretical perspective this study seeks to contribute to a deeper understanding of the characteristics making work teams more effective within innovative contexts, such as STBFs. From a practical viewpoint, the study aims to provide STBF managers with insights that may help them to build more effective teams by means of team composition and conflict management strategies.

2 Conceptual Framework and Hypotheses

We may understand team diversity in terms of heterogeneity in knowledge and skills among team members (Horwitz, 2005). Following the Cognitive Resource Diversity Theory (Campion, Medsker, & Higgs, 1993; Hambrick, Cho & Chen, 1996), this heterogeneity may benefit team performance, as team members can constructively contribute to work tasks with distinctive insights and perspectives, thus responding better to work challenges while learning from each other and enriching individual human capital with new vocabulary, cognitive patterns, and work styles.

We argue that such dynamics triggered by team diversity may be highly relevant for STBFs' overall performance in light of the importance that brainstorming and knowledge-sharing has for these firms vis-à-vis the pursuit of innovation (Hülsheger, Anderson, & Salgado, 2009). There is evidence to support these arguments. Somech and

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Drach-Zahavy (2013) have found a positive association between a team's functional diversity and creativity, while Zhou, Vredenburgh, and Rogoff (2013) have found that a team's functional diversity improves its overall performance, although they could not find any relevant effect on team performance of diversity in levels of education and academic majors. Other studies have stressed that the degree of team diversity may also have an effect on hard business outcomes. For example, Valle and Avella (2003) have observed that the use of interfunctional teams (comprised of professionals from different departments) with effective leadership is positively related to customer satisfaction. More recently, Henneke and Lüthje (2007) have found that heterogeneity in the composition of entrepreneurial teams may facilitate innovation in high-tech industries.

In light of the above, we therefore expect the level of diversity in knowledge, skills, and experience within teams to have a positive impact on STBFs' performance. Specifically, we propose the following:

Hypothesis 1: Diversity among team members positively moderates the relationship between teamwork and the organizational performance of STBFs, whereby the greater the degree of team diversity, the higher organizational performance will be.

While teamwork may have a number benefits, it is not a straightforward way to organize work. In particular, there may be situations in work teams that may trigger conflicts among members, such as those related to task allocation, fair rewards, choosing the best strategy to achieve team goals, or social loafing (Wageman, 1995). We argue that team members' capacity for effectively managing conflict (i.e., reducing or resolving conflictive situations) may have an impact on the organizational performance of STBFs.

Team members may effectively manage conflict when they are able to openly discuss the alternative views forthcoming within the team (Lechler, 2001). Such discussion may engender higher levels of information flows and other resources among team members (Chuang, Chen, & Chuang., 2013), reinforce cohesion, build trust within the team (Chou & Yeh, 2007), and ultimately facilitate the adoption of collective and more effective solutions (West, 2002). By openly addressing conflicts, team members may also foster the creation of shared mindsets and languages within the team. These may be defined as similar (and often tacit) sets of knowledge and symbols, as well as attitudes and beliefs, which facilitate decision-making and the coordination of behaviors without the need to formally communicate (Cannon-Bowers & Salas, 2001). In the long-term, such models and languages may drive improved teamwork processes and organizational effectiveness (Schmidtke & Cummings, 2017).

The high pressure and dynamic contexts characterizing STBFs may render team conflicts inevitable in these firms. Conflict management may therefore be a critical facilitator of teamwork's influence on organizational performance. This argument receives some empirical support from Lechler (2001), who has found that outcomes such as customer satisfaction and efficiency are positively related to conflict management within the entrepreneurial teams of German technology-based firms. Thus, we propose the following:

Hypothesis 2: Conflict management in teams positively moderates the relationship between teamwork and the organizational performance of STBFs, whereby the greater the degree of conflict management, the higher organizational performance will be.

Within-team conflicts may increase when there are higher degrees of diversity among members (Foo, 2011). Such conflicts may emerge when members, by virtue of their idiosyncrasies, disagree on issues related to the assigned tasks, goals, decision-making areas, or work methods. Pelled, Eisenhardt, and Xin (1999) have indeed found that team diversity increases cognitive conflict among team members. For example, the members of a production department may have very different perspectives on a given issue to those held by the marketing department due to their distinctive reference framework. We therefore argue that conflict management may become more relevant as a facilitator of the effect of teamwork on organizational performance when the degree of diversity among team members increases. We therefore propose the following hypothesis:

Hypothesis 3: The moderating effect of conflict management on the relationship between teamwork and organizational performance will be stronger when teams have a greater degrees of diversity among team members.

Figure 1. depicts the research model in this study.

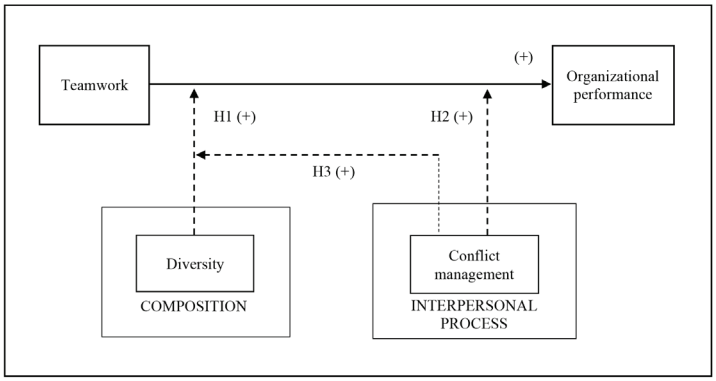


Figure 1. The proposed research model

3 Methodology

3.1 Type of research and participants

This study is a quantitative survey-type research. The population sample consists of STBFs in Brazil with fewer than 50 employees (consistent with the definition of small firms provided by the European Commission, *Instituto Brasileiro de Geografia e Estatística* - IBGE and *Serviço Brasileiro de Apoio às Micro e Pequenas Empresas* - SEBRAE), with more than three years of market participation (Andries & Debackere, 2007), and independently owned. The final sample includes 107 such companies (for a return rate of 18%), of which 56% belong to the high-technology service industry, 24% to the advanced manufacturing industry, 10% to the biotechnology industry, 6% to the chemical industry, and 4% to other industries.

3.2 Procedures and data collection techniques

Companies were contacted by phone to communicate the purpose of the study, request an e-mail address for sending the survey, and encourage participation in the research among owners and managers. The companies contacted belonged to associations of technology-based firms, technology development centers, agencies that promote innovation and development, technology parks, or were Brazilian university spin-offs, or companies that had participated in technology innovation contests.

Data gathering involved a structured survey with closed-ended questions. This survey was sent to companies via e-mail. It contained three sections: the first one dealt with general information on the company and its context; the second one was about teamwork; and the third focused on organizational performance. We used two sources of information to define the items corresponding to each section: a) a review of the literature on teamwork and organizational performance, and b) exploratory interviews and discussions with owners and executives from different STBFs. An executive member of each participating company answered the survey.

3.3 Measures

In order to capture the degree of teamwork within each STBF, the survey asked respondents to use a seven-point scale to indicate the approximate proportion of employees-belonging to at least one work team, where 0=none (0%); 1=few (1–19%); 2=some (20–39%); 3 = around half (40–59%); 4= most (60–79%); 5=almost all (80–99%); and 6=all (100%). 52.3% of the companies indicated that all or almost all their employees belonged to at least one work team, while the rest of the companies surveyed indicated lower or significantly lower degrees of teamwork. The distribution was so asymmetrical that we dichotomized this variable (1 = all or almost all employees belong to at least one work team: 0 = otherwise).

We measured diversity by means of a three-item scale derived from Campion, Medsker, and Higgs (1993) (α = 0.702). An exemplary item was, "Team members have different backgrounds and experiences". Respondents used a seven-point scale to indicate the level of agreement with each item (1 = strongly disagree; 7 = strongly agree). To measure conflict management, we used a five-item scale adapted from that developed by Lechler (2001) for capturing conflict management among entrepreneurial teams (α = 0.97). For example, one item from the scale was, "Disagreements between team members are frankly discussed". On a seven-point scale (1 = strongly disagree; 7 = strongly agree), respondents had to indicate their level of agreement with each item.

Our dependent variable, organizational performance, is multidimensional, so we measured it through a set of financial and non-financial indicators (Ghobadian & O'Regan, 2006). We measured the following indicators on a seven-point scale (7 = A lot better than average in the industry; 1 = Well below average in the industry), and therefore selected the following: innovation (three items); flexibility (three items); quality (three items); profitability (three items); and customer satisfaction (three items). The items were adapted from Escribá-Esteve, Sánchez-Peinado and Sánchez-Peinado (2008), Ghobadian and O'Regan (2006), and Henneke and Lüthje (2007). The variable organizational performance corresponds to the mean of the scores in each one of these 15 items (α = 0.82).

We considered the following variables as controls: industry (Shrader & Siegel, 2007), years of operation (Delarue, Van Hootegem, Procter, & Burridge, 2008), headcount (Delarue *et al*., 2008), initial sales level (Doutriaux, 1992), and government orientation (Doutriaux, 1992).

4 Results

Table 1. shows the descriptive statistics for the variables in the study.

	Variables	Mean	SD	1	2	3	4	5	6	7
1	Teamwork	0.780	0.419	-						
2	Diversity	4.583	1.787	0.463**	-					
3	Conflict management	4.475	1.714	0.581**	0.517**	-				
4	Organizational performance	5.075	0.711	0.175	0.124	0.263**	-			
5	Years of operation	11.630	7.454	0.036	0.049	0.146	0.013	-		
6	Number of employees	17.190	15.748	0.195*	0.137	0.268**	-0.022	0.411**	-	
7	Initial sales level	2.060	0.656	-0.227*	-0.254**	-0.028	0.152	-0.019	0.075	-
8	Government orientation	1.970	1.376	-0.014	-0.022	-0.020	0.136	0.050	0.076	0.162

N = 107

** p<0.01; * p<0.05

Table 1. Descriptive statistics

To test the research hypotheses, we performed OLS analyses, with the results shown in Table 2.

	Organizational performance				
	Model 1	Model 2	Model 3	Model 4	Model 5
Chemical industry	-0.367	-0.132	-0.122	-0.091	-0.134
Advanced Manufacturing industry	0.18	0.193	0.231	0.244	0.240
Biotechnology industry	-0.477*	-0.451	-0.425	-0.382	-0.474
Other industries	-0.089	-0.034	-0.064	-0.034	-0.027
Years of operation	0.006	0.003	0.002	0.001	0.003
Headcount	-0.005	-0.006	-0.005	-0.005	-0.005
Initial sales level	0.259*	0.243*	0.230*	0.224*	0.241*
Government orientation	-0.015	0.004	-0.007	-0.004	-0.017
Teamwork	0.416*	0.079	0.133	0.214	0.343
Diversity		-0.017	-0.131	0.044	0.015
Conflict management		0.140	0.186*	-0.021	0.281
Teamwork × Diversity			0.195*		0.000
Teamwork × Conflict management				0.229*	-0.128
Diversity × Conflict management					0.088
Teamwork × Diversity × Conflict management					-0.024
ΔR2		0.039	0.029	0.029	0.043
R2 adjusted	0.063	0.086	0.110	0.109	0.096
F	1.780	1.902*	2.077*	2.069*	1.745

[a] Reference industry: High-technology services

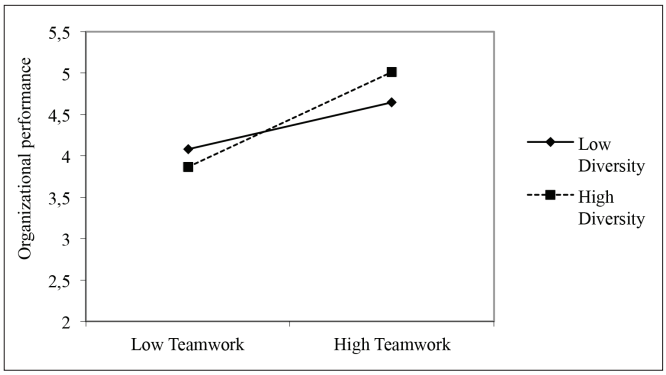
** *p<0.01; * p<0.05*

Table 2. Results of the regression analyses

Model 1 includes only the controls and the variable teamwork, while Model 2 also includes diversity and conflict management. The results in Model 2 indicate that only the control variable "Initial sales level" was significant.

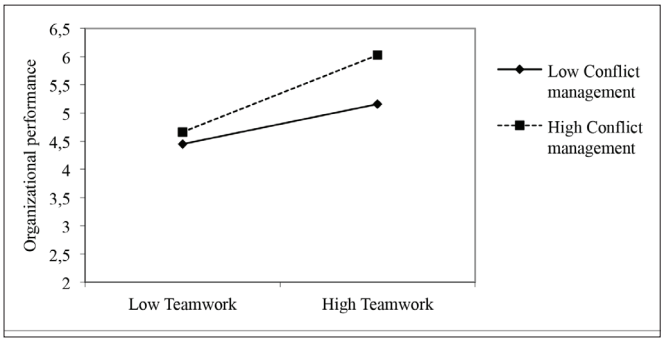
We introduced the interaction between teamwork and diversity in Model 3. As shown, this interaction is positive and statistically significant. Hypothesis 1 is therefore supported. Figure 2 illustrates the effects this interaction has on organizational performance.

Figure 2. Effects of the interaction between teamwork and diversity on organizational performance.



Model 4 includes the interaction between teamwork and conflict management. The regression coefficient for this interaction is positive and statistically significant, thus supporting our second hypothesis. Figure 3 plots these results.

Figure 3. Effects of the interaction between teamwork and conflict management on organizational performance



Finally, we introduced the triple interaction between teamwork, diversity, and conflict management in Model 5. As Table 2 shows, this interaction was not statistically significant, and does not therefore support hypothesis 3.

It is worth mentioning that despite the high correlations between some of the variables in the study, the VIF values are well below 10, suggesting that multicollinearity is not a serious issue in our analyses (Hair, Black, Babin, & Anderson, 2010).

5 Conclusion

This study has used a survey-type research method to provide a more detailed analysis on the way teamwork contributes to organizational performance, consistent with the call made by West, Brodbeck, and Richter (2004), Delarue *et al.* (2008) and, more recently, Klotz *et al.* (2014). In particular, our empirical analysis suggests that team diversity and conflict management may be critical drivers of teamwork effectiveness in the context of STBFs. However, contrary to what we anticipated, conflict management does not seem to acquire more importance as a driver of teamwork outcomes on organizational performance in more diverse team environments. In other words, this result suggests that conflict management may play a similar (beneficial) role regardless of the degree of team diversity. Therefore, teams with low degrees of diversity should also attend to conflict management if they are to perform better.

From a more practical perspective, this study provides STBF managers with some insight on the kind of teams they should build and nurture. First of all, they should avoid team homogeneity by choosing team members with distinctive skills and competencies. Furthermore, they should pay special attention to the way within-team conflicts are managed. Teams that manage to reduce or resolve conflictive situations do indeed seem to favor organizational performance. STBF managers may therefore be interested in providing the members of teams in their firms with the necessary training to tackle conflictive situations in a timely and constructive manner.

This study is not without its limitations; one of which is sample size, as it may limit the generalizability of the findings. Nevertheless, the response rate of 18% in this research is similar to that in previous studies (e.g., Boone and Hendrix, 2009), and in line with the 17% trend that Cycyota and Harrison (2006) report in their meta-analysis. A second limitation involves the cross-sectional nature of the data, which calls for caution when interpreting causal relationships, as there may be potential reverse causality between our dependent and independent variables. Furthermore, as the data come from a single source (i.e., an executive member of each STBF in the sample), there is a potential threat of common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). A final limitation is the fact that the data are limited to the Brazilian context. As the effect of work practices may depend upon the socio-institutional context (Yalabik, Chen, Lawler, & Kim, 2008), this research cannot be extrapolated to STBFs outside Brazil.

Future research may address these issues and extend our analysis to include other moderators of the teamwork-organizational performance relationship in the STBF context. For example, some of these moderators may be related to internal team organization (e.g., level of team member interdependence, and relative level of team autonomy), as well as to interpersonal processes among team members (coordination intensity, degree of cooperation, and member commitment).

There is certainly a great deal of research to be carried out to fully understand the teamwork-organizational performance link within STBFs, and we hope that our study will inspire further work in this direction.

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The Influence of Country of Origin Cues on Product Evaluation: Evidence from Swiss and German Consumers

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Abstract: This study aimed to investigate the influence of visual symbols on the perception and evaluation of two fictitious products as well as the effect of demographic characteristics (nationality) on consumers' evaluations. A sample of 373 participants was split into two groups and two experimental conditions (products with Swiss symbols and products without Swiss symbols). One group of participants rated the packaging without a Swiss flag and the other one rated the same packaging with a Swiss flag. A semantic differential scale and the Self-Assessment Manikin (SAM) were used to assess attitudes toward the products. Results confirm that there are differences between the two independent groups and that nationality has an effect on product perception and evaluation. Visual symbols such as a country flag can lead to a better product perception and evaluation. Finally, implications for research are discussed.

Keywords*:* visual symbols; country of origin; Swiss symbols; product evaluation; product perception.

Submitted: March 26th 2017 / Approved: Jun 30th 2017

Introduction

Although the Country of origin (COO) has been widely investigated in the past years, it is still a concern in international marketing (Koschate-Fischer, Diamantopoulos & Oldenkotte, 2012). COO cues play a significant role in product evaluation (Maheswaran & Chen, 2006). According to the cue utilization theory, consumers make their inferences about the quality of a product based on many cues like color, price, packaging, and country of origin or production (Jacoby, Olson & Handdock 1971). Thus, country of origin symbols also known as "made in" labeling (O´Mara, Cort & Palin, 2011) are used in marketing and branding of products to differentiate themselves and to associate the products with positive attributes (Brodie & Sharma, 2011). Consumers presume traits of the product based on the stereotypes associated with the country of origin and the experiences with other products of that country (Dagger & Racit, 2011). Consistent with this, research on this topic confirms that many consumers make product evaluation and purchase decisions based on country of origin cues (Miller, 2011). For example, German brands with the "Made in Germany" cue are perceived as positive when evaluating the quality of the products (Alex & Abraham, 2015). However, researchers still differ whether or not COO is used by consumers to judge a product. On the one hand, previous research showed that COO activates country specific stereotypes, which are automatic and show a cognitive and affective impact comparable to a halo-effect on the product (Herz & Diamantopoulis, 2012). Other research demonstrated that consumers are willing to pay a higher price for a particular product depending on the origin of the traders (Hu & Wang, 2010). O´Mara et al. (2011) also reported that COO serves as a proxy for risk reduction of the purchase in situations where relevant information is missing or unknown.

Opposite to this, a study on fast-consuming products in India showed that COO cues do not have a cognitive use and are even ignored for product evaluation (Alex & Abraham, 2015). Further, Samiee et al. (2005) concluded that consumers do not remember COO as relevant information for product evaluation. Liefeld (2004) proved that consumers do not use the COO as an information cue when making product evaluations, and Balabanis and Diamantopoulos (2008) found that consumers have little knowledge about the country of origin of the products.

The influence of COO on consumers'evaluations has been investigated in many countries (Sin, Ho & So, 2000; Bailey & Pineres, 1997; Ghazali et al., 2008; Lin & Chen, 2006; Haque et al., 2015; Dagger & Raciti, 2011; Alex & Abraham, 2015). Product differentiation and labeling with a "made in" symbol have also been discussed in Switzerland for nearly one decade (Bravermann, 2007); however, the Swiss market needs further research. Swiss products have an excellent reputation both at home and abroad. They are considered to be reliable and of high quality and the economic added value of their Swiss origin is used by Swiss and international companies (Casanova, 2007). According to the results of a survey over 60% of Swiss respondents are ready to pay more than the double for products produced in Switzerland (Bundesamt für Landwirtschaft, 2007).

Since there is so much disagreement about whether COO has an effect or not and there is no much research with the Swiss market, this study aims to extend previous research on COO cue utilization by testing the use of visual symbols on Swiss and German consumers and its influence on product judgement. Specifically, the study investigates whether the Swiss flag has an effect on consumer behavior and product evaluation.

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ISSN: 0718-2724. (http://jotmi.org)

Another important point to be considered is that the products shown in this study are not typical from Switzerland, but just branded with the Swiss flag. Previous studies on COO have used the term as either the origin of the product (the country of production) or the origin of the brand (home country of the brand). Research has confirmed that consumers use both COO definitions to make inferences about the quality of the product (Johnson, Tian, & Lee, 2016). According to Johnson et al. (2016), the "country of origin fit" plays a meaningful role in the evaluation of products. The country of origin fit refers to whether the product and brand origin are the same. In the opposite situation where the country of the product and the brand are different, then there is no country of origin fit. Sangwon, Zachary, and Xin (2009) demonstrated that the country of origin fit leads to a more positive evaluation of the product than no fit. Products shown in this research are not typical from Switzerland, but just branded with the Swiss flag and therefore with a low COO fit.

Consumer knowledge about the product is also an important factor that influences the COO cues (Chiou, 2003; Mahswaran, 1994). Consumer knowledge refers to the consumers´ experiences related to the product, which has an influence on product evaluation (Alba & Hutchinson, 1987). Brand familiarity is one of these consumer knowledge dimensions. Being familiar with a brand or product implies that no additional information will be used to evaluate the product. Accordingly, unfamiliar brands will lead to product evaluations based on COO cues (Alex & Abraham, 2015). This study used fictitious and therefore unfamiliar brands and consequently we expect that COO cues will influence product evaluation.

Previous studies have also demonstrated that demographic variables like age (Bailey & Pineres, 1997; Huddleston et al., 2001), gender (Sharma et al., 1995), the level of education (Insch & McBride, 2004) have an influence on the COO effect. According to this, consumers' demographic characteristics may influence the way they perceive and evaluate products. Therefore investigation should focus on the identification of further demographic variables that influence the COO effect.

Since the variables associated with the evaluation consumers make on a product are diverse, the primary goal of this investigation was to examine the influence of visual symbols on the perception and evaluation of two fictitious products. Although there is no country of origin fit in this study, the authors assume that the COO will have an effect on product evaluation. Also, the study investigates a further demographic characteristic and its influence on the COO effect. The specific goals were: a) to examine the influence of COO cues (Swiss flag) on the evaluation (acceptance and quality of the product) of two unfamiliar products with low COO fit with Swiss and German consumers and; b) to analyze the effect of participants' nationality on product evaluation.

Method

Participants

The sample consisted of 373 participants (47% men and 53% women) with ages ranging from 18 to 83 (M = 39.03, SD = 14.44). Regarding nationality, (51%) were Swiss, (46%) German and (3%) had another nationality. The participants in our study were recruited using a non-random sampling procedure through the research panel Research-Now, social networks (Xing, LinkedIn, and Facebook) and through the online campus of a German distance learning university.

Design

Independent variables

Stimulus materials were developed by a graphic designer and included two products: a rice package and a toothpaste tube (see Figures 1, 2, 3 & 4). The products did not have any specific brand marks or details that participants could recall to avoid the influence of existing brands and make them unfamiliar to the participants. The pictures of the products were identical and differed only in the visual Swiss symbol (Swiss flag).

Figure 1. Rice package without Swiss symbol

Figure 2. Rice package with Swiss symbol

Figure 3. Toothpaste tube without Swiss symbol

Figure 4. Toothpaste tube with Swiss symbol

Dependent variables

To assess participants' attitudes towards the products, the study used two methods. The first method was the semantic differential scale, which we administered as described in Bortz and Döring (2005). Eight of the 25 items were adapted to the purpose of this study, and an additional item was added (see Table 1). The scale consists of 26 bipolar adjective pairs. Participants evaluated the products on a 7-point scale.

Table 1

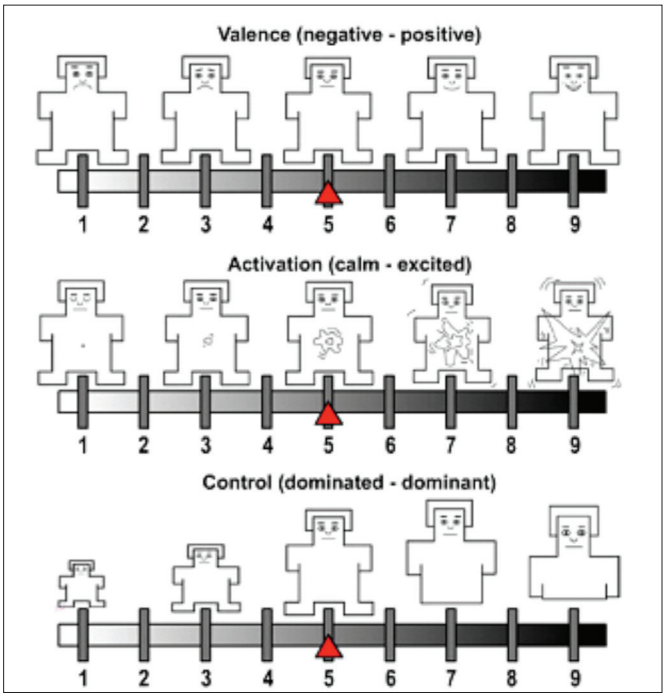
Semantic differential with 26 bipolar adjective pairs

Adjective Pairs
Tender / hard
Bright / sad
Cheap / expensive
Strong / weak
Generous / thrifty
Eco-friendly / wastful
Passive / active
Playful / serious
Conservative / open
Helpful / selfish
Traditional / modern
Exclusive / average
High-tech / old-fashioned
Peaceful / aggressive
Chaotic / structured
Quiet / loud
Strict / flexible
Robust / tender
Reasonable / discontented
Wild / sanft
Innovative / uninspired
Fresh / tired
Reliable / unstable
High-quality / inferior
Shy / sociable

Source: Authors

The second method was the Self-Assessment Manikin (SAM, see Figure 5), which measures the affective dimensions valence, arousal, and dominance associated with the products (Morris, 1995). Participants were asked to rate their affective reaction to the products on a 9-point scale. Both scales are useful for measuring affective responses and complement each other (verbal vs. nonverbal measurement). It has also been shown that both scales hold the same dimensional structure (Osgood et al., 1957) and are highly correlated (Bradley & Lang, 1994).

Figure 5. Self-Assessment Manikin (SAM)



Furthermore, participants were asked to estimate the price (CHF or EUR), the acceptance and the quality of the products: "How do you estimate the quality of the product?" Participants responded on a 7-point scale with endpoints labeled very bad/very good, "Do you know the product?," "Have you already bought and consumed the product?," "Would you buy and consume the product?". They also rated how ecologically friendly the product is (7-point scale with the point labels very little and very strong), how the price-quality relationship is and if the products meet their expectations; both items on a 7-point scale with the labels very bad/very good.

Demographic variables

Participants reported background information like gender, age, place of residence and nationality (these two variables were limited to Germany, Switzerland, Austria and other).

Procedure

The questionnaire was first pretested by administering it to a Swiss sample (N = 33). The results of the pretest showed that the selected items were appropriate for the purpose of the study. Moreover, the pretest confirmed the results of past studies (Osgood et al., 1957;

Bradley & Lang, 1994). According to factor analyses, the items of both scales loaded into similar factors. No changes were needed after pretesting.

The final questionnaire was developed with SoSci Survey (online tool), which automatically randomized participants into two conditions (products with flag/products without flag). Participants were assigned to one of the two experimental conditions (products with the Swiss symbol or products without the Swiss symbol). The first condition included Figures 2 and 4, the second condition included Figures 1 and 3. The link was distributed over 11 days on ResearchNow, social networks and the online campus of a German distance learning university. Participants then completed the questionnaire.

Results

Reliability

A Kolmogorov-Smirnov test was used to test for normality on the main dependent variables for both products. The percentage on the semantic differential D (373) = 0.42, p < .05, and the SAM D (373) = 3.77, p < .05, were both significantly non-normal. Because of this, non-parametric tests were used to analyze the data. Both scales had good reliabilities SAM α = .75 SemDiff α = .90.

Factor Analysis

Initially, a principal component factor analysis with varimax rotation was conducted on the 26 semantic differential items for both products to assess dimensionality of the constructs and identify unreliable items. The Kaiser-Meyer-Olkin measure confirmed the sampling adequacy for the analysis .80 for the rice and .75 for the toothpaste, which is above the recommended value of .6. The Bartlett's test of sphericity was significant for both products: rice $\chi 2$ (66) = 1532.83, $p < .01$ and toothpaste $\chi 2$ (66) = 1525.44, $p < .01$. These results confirmed that the correlations between the adjectives were strong enough for PCA. The analyses and eigenvalues revealed that three components were the best option for the final analysis because a) it explained 63% of the variance and b) of its previous theoretical and research support. Usually, the list of adjective pairs loads onto three factors similar to the dimensions of the SAM (pleasure, arousal, and dominance) (Osgood et al., 1957). To increase the reliability of the scales, some adjectives were removed. Tables 2 and 3 show the factor loadings after rotation. Factor one represents the dimension pleasure, factor two arousal, and factor three dominance.

Table 2

Factor loadings of the adjective pairs for the product Rice

	Factor 1 "Pleasure"	Factor 2 "Arousal"	Factor3 "Dominance"
exclusive/average	**.789**	-.079	-.137
high-tech/old-fashioned	**.770**	-.104	.006
innovative/uninspired	**.840**	-.013	-.058
fresh/tired	**.692**	.381	-.133
high-quality/inferior	**.774**	.235	.125
peaceful/aggressive	-.039	**.782**	-.143
reasonable/discontented	.096	**.776**	.039
quiet/loud	-.289	**.654**	-.235
reliable/unstable	.338	**.749**	.097
soeber/dreamy	-.475	.307	**.509**
strict/flexible	-.137	-.104	**.769**
robust/tender	.102	-.123	**.791**

Source: Authors

Table 3

Factor loadings of the adjective pairs for the product Toothpaste Tube

	Factor 1 "Pleasure"	Factor 2 "Arousal"	Factor3 "Dominance"
Bright/sad	**.578**	.492	-.022
Strong/weak	**.646**	.164	.396
Exclusive/average	**.744**	-.242	-.198
High-tech/old-fashioned	**.790**	-.118	-.066
Innovative/uninspired	**.837**	-.063	-.147
Fresh/tired	**.589**	.448	.084
Peaceful/aggressive	-.050	**.775**	-.279
Reasonable/discontented	.146	**.748**	.238
Quiet/loud	-.353	**.635**	-.214
Soeber/dreamy	-.364	.423	**.537**
Strict/flexible	-.074	-.170	**.799**
Robust/tender	.017	-.057	**.813**

Source: Authors

Main Analyses

Differences between the groups

There was a significant association between the type of visual stimuli (with or without Swiss flag) and the emotions associated with both products. Results of SAM ratings show significant differences for the rice in the arousal dimension χ^2 (1) = 4.86, $p < .05$. Results for the toothpaste indicate a significant difference for the dimension pleasure χ^2 (1) = 3.97, $p = .05$ and the dimension dominance χ^2 (1) = 3.98, p = .05. Additionally, the item "How ecologically friendly is the product?" revealed a significant difference for both products between the groups χ^2 (1) = 4.18, $p = .05$.

The results of the semantic differential show only significant differences between the groups for the toothpaste product. There were significant differences for factor one of the semantic differential (pleasure) χ^2 (1) = 4.08, p < .05.

Effect of the nationality

A Kruskal-Wallis test was conducted to test the effect of nationality as a covariate. Results in Table 4 show a significant difference for the first factor "pleasure" of the semantic differential for the product rice $H(2) = 20{,}6263$, $p < .01$ as well as for the first factor "pleasure" $H(2) = 9{,}0783$, $p < 0.01$ and the second factor "arousal" of the toothpaste $H(2) = 7{,}2346$, $p < 0.05$. Mann-Whitney U test was used to follow up this finding between Germans and Swiss participants, because these were the only ones that showed a positive difference. After applying the Bonferroni correction, all effects are reported at .0167 level of significance. It appears that nationality influenced the effect of the COO cue on the product evaluation for the first factor "pleasure" for the product rice ($U = 11897$, $r = -0{,}2316$) and the first factor "pleasure" ($U = 13272$, $r = -0{,}1585$) and second factor "arousal" of the toothpaste ($U = 13617$, $r = -0{,}1402$). The same analyses were conducted for the SAM scale (see Table 5). Results show significant effects on all factors of the SAM scale for the rice product "pleasure" $H(2) = 7{,}1453$, $p < 0.05$, "arousal" $H(2) = 9{,}3493$, $p < 0.01$ and "dominance" $H(2) = 19{,}1077$, $p < 0.01$. Post hoc analyses show significant results "pleasure" ($U = 13729$, $r = -0{,}1383$), "arousal" ($U = 13292$, $r = -0$, 1016) and "dominance" ($U = 12545$, $r = -0{,}2021$). It can be concluded that Swiss participants made significantly more positive associations with the product than other nationalities.

Table 4

Effects of nationality on product evaluation (Sem. Diff)

Statistic	Rice			Toothpaste		
	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
Chi-square [a]	20,6263	4,5281	0,5752	9,0783	7,2346	0,2433
df	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000
Sig.	0,0000	0,1039	0,7501	0,0107	0,0269	0,8855
Mann-Whitney	11897	14326	15721	13272	13617	15777
Wilcoxon W	29852	29204	33676	31227	28495	33732
Z	-4,3999	-1,9470	-0,5382	-3,0116	-2,6631	-0,4817
Sig.	0,0000	0,0515	0,5904	0,0026	0,0077	0,6300
Effect (r)	-0,2316	-0,1025	-0,0283	-0,1585	-0,1402	-0,0254

a. Kruskal Wallis Test

Table 5

Effects of nationality on product evaluation (SAM)

Statistic	Rice			Toothpaste		
	Pleasure	Arousal	Dominance	Pleasure	Arousal	Dominance
Chi-square [a]	7,1453	9,3493	19,1077	3,7407	2,0162	2,9910
df	2,0000	2,0000	2,0000	2,0000	2,0000	2,0000
Sig.	0,0281	0,0093	0,0000	0,1541	0,3649	0,2241
Mann-Whitney	13729	13292	12545	14541	14896	14564
Wilcoxon W	28607	28170	27423	29419	29774	29442
Z	-2,6272	-3,0418	-3,8407	-1,7856	-1,3939	-1,7345
Sig.	0,0086	0,0024	0,0001	0,0742	0,1634	0,0828
Effect (r)	-0,1383	-0,1601	-0,2021	-0,0940	-0,0734	-0,0913

Kruskal Wallis Test

Discussion

The present study investigated the influence of visual symbols on product evaluation using two different methods: a semantic differential and the self-assessment manikin. The results reveal differences between the groups. Thus, the products with the Swiss flag were associated with more positive emotions (pleasure, arousal, and dominance) as compared to the products without the Swiss flag. Furthermore, both products with the Swiss flag were rated as more eco-friendly as compared to the products without the Swiss flag. This corroborated Jacoby´s et al. (1971) cue utilization theory, which postulates that consumers make deductions about the quality of the product based on cues like a flag. This is also consistent with previous research (Alex & Abraham, 2015), which clearly indicates that consumers perceived certain brands with the "made in" label cue as positive when evaluating the product. It is important to mention that the products with the Swiss flag were associated with more positive emotions although the COO fit low was. According to Sangwon, Zachary, & Xin (2009), the country of origin fit leads to a more positive evaluation of the product than no fit. Opposite to the findings of (Sangwon, Zachary, & Xin, 2009), in this study participants made positive associations (positive emotions or described products as eco-friendly) although the country of production and the country of origin (low COO fit) were different. Further research is needed to follow up these results and see if products with a high COO fit (like Swiss watches or Swiss chocolates) will lead to more and stronger positive associations with the products.

A social psychological explanation for these results is the activation of specific stereotypes, which are automatically associated with the products when participants see the Swiss flag. The activation of country related stereotypes seems to have an impact comparable to a halo-effect on the product. The halo-effect is that one stereotype associated with the country (i.e. good quality) will overlap all other attributes of the product. Studies on this topic are consistent with this assumption (Herz & Diamantopoulis 2012).

Moreover, the results showed that the participant's nationality influenced the effect of the Swiss flag on the product evaluation. Swiss nationality increased the positive evaluations compared to other nationalities. It seems that national pride and familiarity with the Swiss flag cue increases the effect. This is not surprising because in Switzerland, almost every business uses a Swiss symbol cue on the products and that Swiss people prefer products from their home country (Bundesamt für Landwirtschaft, 2007). Marketing experts are convinced of this fact and consider it an effective "unwritten law". Further research should investigate the effect of Swiss national pride on Swiss product evaluation. It was also observed that the product rice obtained more significant effects than the toothpaste. The data indicates that Swiss participants believed to have already bought and consumed the fictitious rice. This could explain why rice was preferred and obtained more positive evaluations as compared to the toothpaste. A psychological explanation for this is the availability heuristic (Tversky & Kahneman, 1973). A better and quicker availability of the product (I have already bought and consumed the product) is considered as own information. Therefore, the recipient has the feeling that he is more familiar with the product and classifies it as a relevant and high-quality one. Research about consumer knowledge about the product (i.e. brand familiarity) implies that such consumer knowledge will lead to an evaluation of the product without additional information like CCO cues (Alex & Abraham, 2015). Although both products were completely fictitious, Swiss participants believed to have bought and consumed the rice previously, which in turn lead to a better evaluation of the product.

A follow up to investigate the effect of other nationalities and the consumer knowledge about the product will be interesting. Further research should investigate which processes lead to a positive association with the product. Is it due to the activation of country stereotypes or due to the national identity?

Investigating how consumers´ make purchase decisions and what influences their attitudes towards a product is very important for understanding and predicting consumers´ behavior. The results of this study cannot be generalized, but they definitively expand and support previous knowledge on COO cues and their influence on product perception and evaluation as well as the influence of demographic characteristics on COO effect.

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Proposal of a Modelling of the Innovation Process in an International Manufacturing Company

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Abstract: Nowadays, to cope with the competition, and to ensure the durability of their activities, companies have to be able to innovate. Manufacturing companies operating in a B2B market often perceive innovation as a technological result. However, innovation is often more characterized as a process. The needs of the users, and not only the technology, can achieve innovation. In this context, our paper intends to determine how to involve better the users in the innovation process of an international manufacturing company, which is, according to us, representative of the current manufacturing companies. The aim of our research paper is to help manufacturing companies to manage innovation led by users, and to implement their innovation process so that they will be able to set up specific tools for each action of the process. The study proposes a diagram-based language Structured Analysis and Design Technique (SADT) that is based on the normative guide FD X50-271 of the French national organization for standardization (AFNOR). The SADT model we propose usefully complements this guide, to make the innovation process more understandable, practical and operational, for manufacturing companies, which are often helpless when faced with the subject. A critical analysis of the model we propose completed in a manufacturing company through semi-structured interviews of the innovation team and questionnaire for all the employees shows the application of the model in the company.

Keywords: innovation process; manufacturing company; SADT; innovation process model; B2B market.

Submitted: March 29th 2017 / Approved: Jun 30th 2017

Introduction

To cope with increasing competition and to make their activities sustainable, manufacturing companies, where competition is hard, and demand never stops evolving, have to innovate (Andrade et al., 2015). According to Freeman (1991), innovation can be defined as "an iterative process initiated by the perception of a new market and/or new service opportunity for a technology-based invention which leads to development, production, and marketing tasks striving for the commercial success of the invention." Companies know the importance to be innovative, and to diversify their innovation capabilities, but they might learn how to set it up (Camargo et al., 2015). Researchers have tried to simplify the concept of innovation by proposing classifications of it, especially to show that innovation is not only a technical novelty (Garcia and Calantone, 2002). This study focuses on innovation driven by users. It involves people who use the product in their work or home life, who may innovate for their utility, to obtain a solution to their needs and expectations (Von Hippel, 2005). The users may include different groups of people using a product, during its life cycle such as the inventor, the client, the designer, the quality manager, etc. Innovation driven by users is already well implemented in companies operating in a B2C market (i.e. companies sell their products to private individuals), like health equipment (Lüthje, 2004). Manufacturing companies operating in a B2B market, which only sell their products to professionals, often restrict innovation to the Research & Development department; thus the users are few considered. However, several collaboration kinds have to be set up between the different services of a company to favor innovation (Becker and Dietz, 2004). Our study hypothesizes that innovation driven by users can be applicable for manufacturing companies operating in a B2B market, to develop new types of innovation, and to be more competitive.

As far as we know, few research works have focused on the implementation of innovation driven by users in such companies. This study aims to help the companies with B2B marketing system to manage innovation driven by users and to implement an innovation process, especially by setting up specific tools. This paper firstly presents the innovation process, and particularly the one based on the normative guide FD X50-271 of the AFNOR (2014). Then, the Structured Analysis and Design Technique (SADT) language (Ross, 1977) models the innovation process. As an actor of a partner manufacturing company, which stays representative of the current manufacturing companies, the developed model is analyzed critically through a comparative study of the theory and the practice (with semi-structured interviews of the innovation team and questionnaire for all the employees of the company).

The innovation process: theoretical study

The evolution of the vision and of the management of innovation in a company implies the evolution of the definition of innovation itself. Contrary to the traditional view of innovation, such as the commercialization of an invention (Schumpeter, 1942), it is more and more defined as being a process that brings something new to a company or a market. By defining innovation as a process, it enables the companies to depict, manage it and measure it (Zhang et al., 2013). Several kinds of innovation processes are existing: the linear model of Chanaron (1992), whereby the innovation process is sequential and

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mainly product and tech oriented; the « whirling » model of Akrich (1988), which presents a process exposed to many iterations and multidisciplinary actors; and the chain-linked model of Kline and Rosenberg (1986), which is composed of five major pathways, including the central chain-of-innovation, and a box which explains the links between the company and technical know-how. These models seem to be compatible and complementary. However, they mainly detail the methodological approach of the innovation process, but the required resources to set up the process are less detailed. As being an actor of a partner manufacturing company, we need to federate the resources, especially by applying the innovation process of the standard guide FD X50-271 of the AFNOR (2014) (ISO standard on innovation management is currently at the proposal stage). As shown in Figure 1, and according to the AFNOR standard, the innovation process is divided into four domains (marketing and sales; technology; legal, normative and financial; management and organization), and in four steps (exploration; assessment and decision; management of projects; capitalization). The interaction between these domains and steps enables to determine the actions of the process. For each of these actions, it is possible to define the methodological, human, material and technological resources that are required to achieve them. This view of the innovation process emphasizes the definition of each action, and the interactions between the resources, especially the human ones. In the case of innovation driven by users, the latter are actors of the different steps of the process, and the notion of interactions between them is very significant. The user has to be involved in the domains marketing and sales (to determine their expectations and needs), and technology (to be sure that the solution found answers their needs). The user has to be involved in the steps exploration and capitalization. Then, the user has to contribute to the actions A1 "Look for innovation opportunities" and D2 "Capitalize on technologies." We partly based this study on this view of the innovation process, and it is focused on the action A1, to involve the users as soon as the first step. The AFNOR standard does not detail the accurate content and the specific resources of each action. Therefore, we will go into this action A1 and its resources in depth.

Figure 1. The innovation process according to the AFNOR (2014)

	Exploration	Assessment & decision	Management of projects	Capitalization
Marketing & sales	**A1/** Look for innovation opportunities	**B1/** Position the projects in relation to demand	**C1/** Check the coherence of the future products	**D1/** Evaluate and perpetuate the created value
Technology	**A2/** Identify the knowledge to mobilize	**B2/** Validate the knowledge to mobilize	**C2/** Manage technical engineering	**D2/** Capitalize on technologies
Legal, normative & financial	**A3/** Identify the threats / strengths	**B3/** Approve the financial and legal conditions	**C3/** Adapt the legal & financial strategy	**D3/** Deal with the legal & financial monitoring
Management & organization	**A4/** Define the innovation lines	**B4/** Decide on projects to launch	**C4/** Manage the innovation projects	**D4/** Organize the projects feedback

Proposed model: the innovation process as an SADT

In order to detail the action A1 "Look for innovation opportunities" of the AFNOR, after a review of modelling methods and languages that are used to model business processes (SADT, EPC, BPMN, etc.), we have chosen the use of SADT (Structured Analysis and Design Technique) (Ross, 1977). This classic tool has often been used in manufacturing companies, because it is easily accepted, thus justifying our choice (Colquhoun et al., 1993). This paper explains all the sub-actions of the action A1 using SADT, with the related resources.

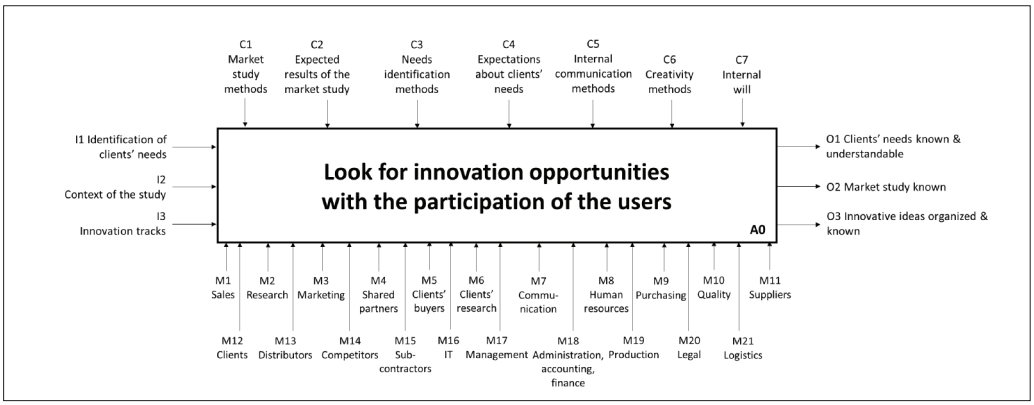
The diagram based language SADT

SADT represents a process in a microscopic way, by detailing its different actions as a hierarchy of functions. An SADT decomposes the actions with the top-down approach, which illustrates the process at several levels and provide a better understanding of this process to the different levels of the hierarchy of a company: this is especially interesting and specific to SADT. Furthermore, the ICOM formalism (Ross, 1985) characterizes SADT, including input data (I); control data (C); output data (O); mechanism (M), which highlight the actions, their order, their tools and their resources. We have decided to focus on human resources, and specifically on the actors, and their roles and skills, who realize the action.

The innovation process as an SADT

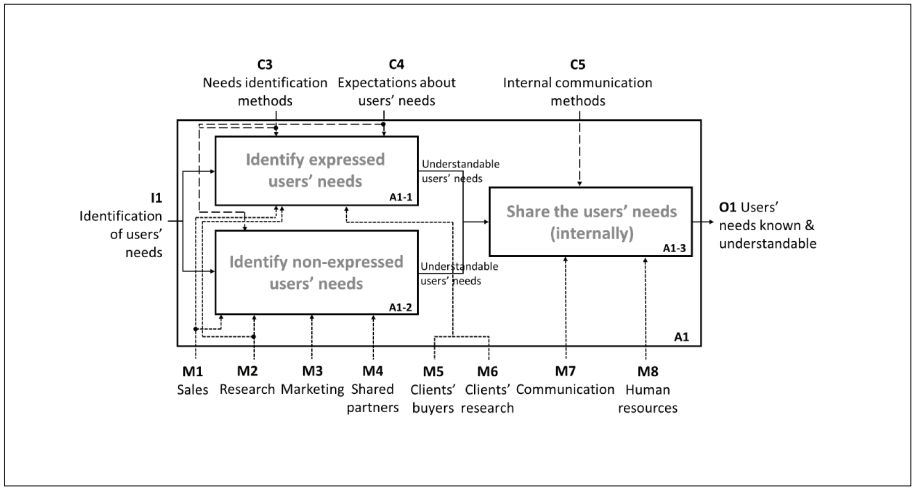
The representation as an SADT of the innovation process analyzes what is lacking for a company, its mistakes, and the inconstancy of its actual system (regarding involvement of actors for example). The SADT model developed in this study identifies the different sub-actions of a manufacturing company, which has to perform to achieve the action A1 of the AFNOR, by involving the users. We have created it thanks to a study of the existing literature, especially in the innovation process, the management of innovation, and the features of innovation for a manufacturing company. The action A0 "Look for innovation opportunities with the participation of the users" of the first level of our SADT is the action coming from the standard guide of the AFNOR, with an emphasis on the users (Figure 2). Users are the most important element in the process, who are requested several times, from the research department (M2) to the suppliers (M11), including the marketing (M3), the quality (M10), the clients (M12), etc.

Figure 2. Action A0 of our SADT model



The second level of our SADT depicts the three sub-actions of our action A0. These three sub-actions are A1 *"Determine the users' needs,"* A2 "*Analyze the market,*" and A3 *"Find innovating ideas."* They enable to understand better the action A0, but they stay generic. We propose to detail them in the third level of our SADT. Figure 3 details the action **A1 "Determine the users' needs"**. It consists in determining the implicit and explicit needs of the users (Kano et al., 1984). It is divided into three sub-actions: (i) *Identify expressed users' needs*: it is about identifying the users' needs (input data: I), such as "I need your parts to be delivered in smaller quantities." The salesmen and research department (human resources: M) can achieve this action, and rephrase the needs in an internal language, so that everybody can understand them (output data: O); *(ii) Identify non-expressed users' needs*: it is about identifying the users' needs (I) which are not expressed, such as "I would like to produce green cars", and not only to propose lighter cars. The marketing department (M) can do a monitoring of these needs (O). The salesmen and the research department (M) can detect the non-expressed needs of the users. External actors (M) can have information on the users not known by the company; (iii) *Share the users' needs (internally)*: it is about sharing the users' needs (understandable) (I), so that they are known and understood by all the departments of the company (O). The internal communication department of the company, or sometimes the human resources department (M), can share this information.

Figure 3. Details of the action A1 "Determine the users' needs" of our SADT, with the ICOM formalism



The action **A2 "Analyze the market"** consists of making a comprehensive market study in which the company is operating (Pickton and Broderick, 2005). The action is again divided into three sub-actions: (i) *Analyze the macro-environment of the company*: it consists of studying the context (I), to determine its influence on the innovation process, and have a complete macro-environment analysis (O). For example, they can especially study the legislation on green cars. The marketing department (M) can do it, but other departments can also assist it; (ii) *Analyze the micro-environment of the company*: it consists of studying the context (I), to determine its influence and have a complete micro-environment analysis (O). All the actors who have information about the context can do this analysis (M) (e.g. salesmen have information about the clients, distributors, and competitors, etc.); (iii) *Share the information (internally)*: it is about sharing the analyses of the market (I), so that all the departments of the company know them (O). The internal communication department of the company, or sometimes the human resources department (M), can share this information.

After having achieved all the monitoring and analysis actions, the company can embark upon the search of ideas (Fink et al., 2012): it is the aim of the action **A3 "Find innovative ideas."** This action is again divided into two sub-actions: (i) *Stimulate the creativity of the different actors*: it consists in stimulating the creativity of all of them who are involved in the innovation process, to transform their innovation tracks (I) into concrete innovative ideas (even in a jumble) (O). For example, an employee can know that a process can be improved, without knowing how to do it; creativity methods could help him to find how to improve the process. All the departments of a company (M) can do this action. Some external actors could also be involved if they want to. For example, the suppliers can propose their innovative ideas, which could lead to new raw materials; (ii) *Share the innovative ideas (internally)*: it is about sharing the innovative ideas that have been selected in the company (I), so that all the departments know them (O). The internal communication department of the company, or sometimes the human resources department (M), can share this information.

The model proposed in this study simplifies the management of the innovation process of a company, as each actor knows what it has to do and at what time it has to do it. The SADT model could usefully complete the process proposed by the standard of the ANOR, especially by detailing the first exploratory state. Thus, as part of our research works, we wanted to apply the innovation process of the AFNOR, and more precisely its action A1 *"Look for innovation opportunities"* to an international manufacturing company operating in a B2B market, which is especially solicitous over the innovation led by its users.

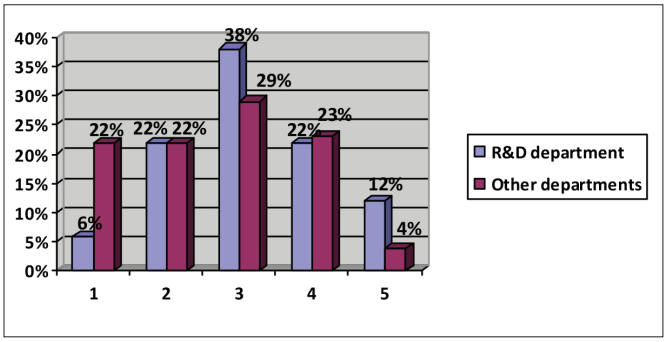
Methods

The chosen company is a French automobile subcontractor, existing for more than two centuries, and with more than 3,200 employees in about twenty plants in the world. Today, it is important to remember that it is complicated for companies to preserve or to protect what is essential to their development, that is to say: their technic creations, their know-how and more widely their strategic information. We think that the chosen company remains indicative, even representative of the current manufacturing companies, given its size, its history, and its international vision. The company would like to involve more its users in its innovation process. Its aim is to be differentiated from its competitors, and to be perceived as a company that can be a creative force, and not only a supplier of parts. The first part of our study was composed of individual semi-structured interviews (Berthier, 2016) of about 45 minutes, with each member of the innovation team of the company. The multidisciplinary innovation team brings together ten members: three from the sales department, five from the research department, and two people from the marketing department. People of the sales and the research departments are in charge of different product ranges, thus enabling a broad representation of the business sectors of the company in the innovation team. The second part of our experimentation was composed of a short questionnaire (Salazar and Holbrook, 2004) of 10 minutes. We e-mailed it to around 1,800 employees. Its main aim was to determine the involvement of the users in the innovation process. To figure out this point, we focus on different points: the departments that are responsible for innovation, the involvement of the employees in the innovation process, the capacity to detect the clients' needs, etc. (Von Hippel, 2005). We conducted a pre-test with ten employees of the company to check question comprehension and to sample the types of answers to get. 245 (13.6 %) employees filled in anonymously our questionnaire. All the departments of the company are represented, as well as the social status. We used Chi-Square Test of independence or Chi-Square Goodness-of-Fit Test in our statistical analyzes, and we accepted $p < 0.05$ as statistically significant.

Results

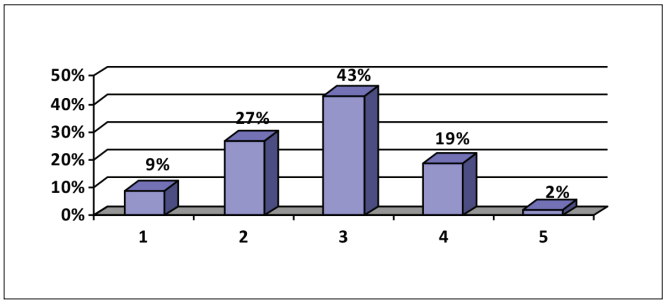
Firstly, through our questionnaire, we have asked the employees to mark their involvement in the research of innovation in the company on a scale of 1 to 5 (5 is the best mark) (Figure 4). Our results show a significant difference in the involvement of the employees in the research of innovation depending on the departments of the company (R&D versus other departments) ($X^2(4) = 10.81$; $p < 0.05$); people from the R&D department are more involved than the others. 72% of the employees of the R&D department gave a mark of 3 or more to their involvement in the research of innovation, whereas only 56% of the other employees gave a mark higher than or equal to 3.

Figure 4. Mark given by the employees on their involvement in the research of innovation (5 is the best mark)



Then, we have applied our action **A1** ***"Determine the users' needs"*** to the studied company. The company tends to focus on the expressed needs of its users. To determine its users' needs, the company limits itself to the information it has internally, or the information easy to find alone, without appealing to partners who are shared with the users (e. g. the suppliers), who can have other information. Indeed, according to all the members from the sales and marketing departments of the innovation team, the needs are only known when the users express them, and the information is only shared with the technical teams. Through our questionnaire, we have also asked the employees to mark the capacity of the company to detect its clients' needs on a scale of 1 to 5 (5 is the best mark) (Figure 5). The results of our Chi-Square Goodness-of-Fit Test show a significant difference in the capacity of the company to detect its clients' needs in comparison with a set of observations ($X^2(4) = 125.92$; $p<0.001$). 36% of the employees gave a mark lower than 3, whereas only 21% of the employees gave a mark higher than 3.

Figure 5. Mark given by the employees in the capacity of the company to detect its clients' needs (5 is the best mark)



Afterward, we have applied our action **A2** ***"Analyze the market"*** to the studied company. The company has well understood the importance of the competition analysis. Indeed, through our semi-structured interviews, we asked the members of the marketing department of the innovation team if a competitor analysis was organized, at which frequency, with which information, etc. They organize a competitor analysis every year, with mainly their key figures. We also asked them if other actors of the market were analyzed. They analyze some clients when the general management or the sales department ask for it. Then, according to the members of the sales and the marketing departments, the information is in general only shared between them, with the general management and the research department

Then, we have applied our action **A3** ***"Find innovative ideas"*** to the studied company. The company has difficulties finding innovative ideas. Apart from some proposals of technic improvements, the company cannot propose innovative ideas. In our questionnaire, we have asked the employees if they have already participated in meetings dedicated to innovation. Our results show a highly significant difference) ($X^2(1) = 11.11$; $p<0.001$) in the participation of the employees in innovation meetings depending on their departments (R&D versus other departments; people from the R&D department are more involved than the others. 40% of the employees of the R&D department have already participated in meetings dedicated to innovation, whereas only 18% of the other employees have done it. We have also asked the employees if they had ever heard about tools/means to transmit their innovation ideas: more than 80% of the employees have never heard about that.

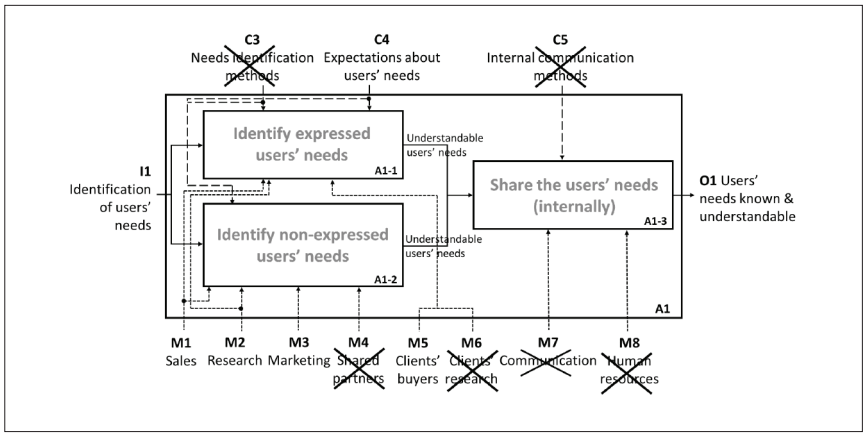
Discussion

The necessity to innovate in companies has been amply demonstrated now. It is even truer for manufacturing companies that have to cope with high competition. Companies face a lot of innovation types (Garcia and Calantone, 2002). Even though companies have understood the importance of innovation, they have to choose which innovation they want to set up, and how to set it up (Camargo et al., 2015). In this paper, we focused on the innovation led by users. This type of innovation is already well implemented in companies operating in a B2C market, but not as well in companies operating in a B2B market (Lüthje, 2004). To help these companies, authors have proposed several innovation processes. We have chosen to focus on the one proposed by the AFNOR in its standard guide FD X50-271, as it details the methodological approach of the process, but also the corresponding resources. To help manufacturing companies to set up the theoretical innovation process of the AFNOR, we have proposed in this paper a view of this process that uses a diagram-based language SADT. Thanks to this approach, we think that all the actors of manufacturing companies could better understand the actions they have to achieve to develop their innovation process. Our approach enables to easily detect the lacks, the mistakes, etc. of this process, to better structure and manage it. We have done a case study in a manufacturing company, through semi-structured interviews conducted with a multidisciplinary team in charge of innovation, and through a questionnaire intended for all the employees, to validate its relevance.

Firstly, our results show that the R&D department of the studied company is more involved in the innovation process than the other departments. This result is in agreement with the ones of the literature, which show that the R&D has always had an essential role in manufacturing companies. After having studied the main American manufacturing companies between 1976 and 1985, Morbey (1988) concludes that there is a strong link between the expenses in R&D and the growth of sales. This is why, since this period and even now, the R&D, according to Rothwell (1992) often stays the main source of innovation. However, it is also important to emphasize that the R&D is not as important for all manufacturing companies. After having studied 130 American companies, Freeman has concluded that the bigger the company is, the more important the R&D is. According to him, the R&D generates twice the income for companies with more than 25,000 employees than for the ones with less than 25,000 employees (Freeman and Soete, 1997). The study of Italian manufacturing companies proposed by Santarelli curbs the proposition of Freeman, by assuring that the R&D is very efficient for companies of more than 500 employees, as well as the involvement of external actors of the company (Santarelli and Sterlacchini, 1990). Thus, few actions of the AFNOR standard are integrated and respected in these companies. Indeed, because of the high involvement of the R&D department, the company focuses on the *technology* domain, which only represents four actions of the AFNOR standard.

Then, our results show that the company tends to focus on the expressed needs of its users. It is strengthened by the works of Bailom et al. (2007), who have studied the failure of different companies, and have come to the conclusion that companies focus on expressed and communicated needs of their clients, particularly in the needs publicly published in the market studied. Thanks to the analysis of twenty-six American Fortune 500 financial services firms, Alam (2006) has observed that the problem of needs identification is not only linked to the companies, but also to the clients. Indeed, some of them can impose a short-term vision, or not fully commit themselves because of the lack of any tangible benefit to them. The SADT in the following Figure 6 presents the details of these observations. We built it in partnership with the innovation team of the company. We can highlight some differences between the theoretical model and the reality of the company. For example, the human resources (M) are different: the company does not involve the shared partners and the client's research department, and there is no internal communication department.

Figure 6. Application of the action A1 "Determine the users' needs" of our SADT to the studied company; the company does not apply the crossed items



Afterward, our results show that the company mainly focuses on the analysis of its competitors, and not on the other actors of its environment. It is probably linked to the fact that the automobile industry has been a highly competitive market for a long time. Indeed, Pavlínek and Janák (2007) have shown that competition highly influences the network and the market in the automotive industry, and suppliers are mainly selected on a price-based competition. Consequently, the company limits itself to the common services to analyze the market: the marketing, sales and research departments. Besides, the information circulates with difficulty from one department to another one. Here again, we can highlight some differences between the theoretical model and the reality of the company. For example, the human resources (M) are different: the company does not involve the majority of the external actors who could be involved in the action, the suppliers and the clients are very little involved, and the company only involves the marketing, the sales, the research and the purchasing departments. There is also no internal communication department in the company.

Finally, our results show that the company has difficulty finding ideas that are not technical, mainly because technic departments are the ones the most involved in creativity meetings. According to Vissers and Dankbaar (2002), who have interviewed NPD (new product development) supervisors of medium-sized companies, manufacturing companies consider innovation and creativity as teamwork. However, they involve the "R&D team" in the creativity step, but it is limited to few departments of the company: the engineering, the manufacturing, and the marketing. Here again, we can highlight some differences between the theoretical model and the reality of the company. For example, the human resources (M) completely differ: the company only involves technic teams of the research department, and there is no internal communication department.

By putting to the test our SADT model in a manufacturing company, we were able to highlight the lacks and the mistakes linked to innovation in the company. They can easily identify the points where they can get better. The following Table 1 proposes a summary of the improvement lines of the first action of our SADT. It is possible to do the same thing for the other actions of our SADT.

Table 1. Recommendations for the studied company for the first action of our SADT

Actions of the SADT	Possible improvements
A1 *"Determine the users' needs"*	▪ Better identify its users' needs, expressed or non-expressed; ▪ Diversify internal and external actors involved; ▪ Prioritize its users' needs before thinking about its technical skills; ▪ Better share the information internally.

The company concurs with the model we propose and considers that our approach is instructive and pertinent. Indeed, further to the recommendations we have done after having applied the SADT to the studied company, the company has decided to set up several tools and methods to favor the implementation of its innovation process. For example, to involve more of its collaborators, and diversify the skills of the people involved (action A3 "*Find innovative ideas*"), the company will set up an innovation room, and organize innovation contests. To help the company, we work on the identification of tools that should favor the implementation of the innovation process. It may differ from one company to another one, according to its features (size, market, etc.) and its culture (Katsikis et al., 2016). This is why we work on a proposition of a tools selection method to support and favor innovation led by users in a manufacturing company, according to these factors.

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ISSN: 0718-2724. (http://jotmi.org)

Technology Epiphany and an Integrated Product and Service

*Satoru Goto**

Abstract: This study aims at exploring how an integrated product and service contributes to achieving Innovation of Meaning (IoM) or technology epiphany. Existing IoM studies have focused on intended meaning (as defined in new product development) and ignored the received meaning that users reconstruct. The process by which a user assigns meaning to things can not only be static but also dynamic. This study focuses on integrated products and contexts offered by services and analyses the case of Japan's largest manufacturer of ankle-foot orthoses. The results show that the service guides the users to reconstruct the meaning in dynamic cognitive processes and use the metaphors that contribute to the consistency between products and services.

Keywords: innovation of meaning; technology epiphany; service; context; emotion

Submitted: April 26th 2017 / Approved: July 4th 2017

Introduction

Innovation of meaning (IoM) is emerging as a new focal point in the innovation management discourse (Verganti, 2008; Kembaren, Simatupang, Larso, & Wiyancoko, 2014; Farhana & Bimenyimana, 2015). Verganti (2011) suggested that firms driven by design build and nurture a competitive advantage through a combination of radical changes in technologies and meanings; he defined such a combination as *technology epiphany*. In the existing marketing literature, Levy (1959, p. 118) emphasized that 'People buy things not only for what they can do but also for what they mean'. Moreover, Krippendorf (1989) suggested that creating a product meaning is a crucial issue of design, defining it as 'design is making sense (of things)'. Thus, technology epiphany is the one of the challenges beyond the traditional view of technological innovation as a driver of advancement in product performance (Simoni, Cautela, & Zurlo, 2014).

Recently, many studies have attempted to understand issues related to IoM: the categorization of IoM (Rampino, 2011), design research (Norman & Verganti, 2014), the process of IoM (Kembaren et al., 2014; Verganti, 2017), and technology epiphany (Goto & Ishida, 2014; Buganza, Dell'Era, Pellizzoni, Trabucchi, & Verganti, 2015). Although these studies emphasize the importance of an intended meaning that companies develop in new product development (NPD), users reconstruct the meaning in the contexts in which they experience the product or service (Kazmierczak, 2003; Crilly, Moultrie, & Clarkson, 2004). This poses a question to researchers, challenging them to further the understanding of the process to realize IoM. It is difficult to control reconstructed meanings by considering a single product because of the lack of context of use.

Context is defined as the 'information available to a particular person, and on a particular occasion, for use in the meaning-ascription process' (Kleine & Kernan, 1991, p. 311). Such information is offered in service encounters, which consist of service evidences (Shostack, 1984) and human-to-human interactions (Pacenti & Sangiorgi, 2010). Bellini, Dell'Era, Frattini, and Verganti (2017) noted that the generation of a new meaning is the result of an interaction between customers and companies in the physical space of services. More specifically, when a radical technology emerges in the market, a company faces the challenge of explaining to customers how it works and what it means (Eisenman, 2013). Thus, the service should be designed to help users reconstruct the intended meaning of the product. This means that it may be important to synthesize the perspectives of NPD and new service development (NSD).

Despite the importance of a comprehensive study on products and services, no attempts have been made till date to study the relationship between technology epiphany and integrated products and services. Thus, this study seeks to address this gap by answering the following research questions:

- RQ1: How does company develop an integrated product and service under a consisted meaning?
- RQ2: How do users reconstruct a meaning based on their interaction with an integrated product and service?

This study pursues these goals by exploring a case study in the assistive products (APs) industry, particularly, the Japanese ankle-foot orthosis (AFO) industry. The APs industry is a recent focus of *Inclusive design*, which aims at reducing product-related stigma. Correia de Barros, Duarte, and Cruz (2011) noted that the aesthetics and stigma associated with APs discourage consumers to use them. To change the meaning attributed by people to the use of APs is a socio-technical challenge for companies in the industry. Thus, this paper contributes to the limited understanding of the role of an integrated product and service to achieve technology epiphany and provides practical guidance to develop this understanding in the APs industry.

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ISSN: 0718-2724. (http://jotmi.org)

The structure of the paper is as follows. The next section briefly investigates the existing literature on the definition of IoM and the role of services. This is followed by the research design and data analysis. Then, the paper presents a comprehensive model, including the relationship between IoM and a service, and the process of users' cognitive response.

Definition of IoM

A product's appearance bears both tangible features and intangible attributes. The tangible features are dictated by size, material, colour, shape, and texture, *inter alia* (Bloch, 1995). The tangible features communicate information regarding functionality, aesthetics, and symbolism (Eisenman, 2013). Consumers assess a product based on this set of information, as received and perceived by the senses (Crilly et al., 2004), and the intangible attributes of a product are related to this assessment.

The existing literature shows the three-dimensional segmentation of the intangible attributes of a product: *aesthetic impression*, *semantic interpretation*, and *symbolic association* (Crilly et al., 2004). Aesthetic impression describes aesthetics that appeal to the human senses. Semantic interpretation refers to a consumer's response to functionality, utility, mode of use, and other qualities. Symbolic association is described as the personal and social significance assigned by the user, by virtue of messages, symbols, culture, and meaning (Table 1 summarizes the other definitions, as found in the literature).

Verganti (2008) proposed a radical change of meaning as *design driven innovation* (DDI), defining meaning in a broader sense (e.g., emotional and symbolic value). Meanwhile, Rampino (2011) categorized the four different kinds of innovation driven by design as *aesthetic innovation*, *innovation of use*, *meaning innovation*, and *typological innovation*. Aesthetic innovation relates to aesthetic impression, innovation of use refers to semantic interpretation, and meaning innovation concerns symbolic association. Meaning innovation happens when form, mode of use, and technology are radically changed (Rampino, 2011), because all aspects of intangible attributes are highly interrelated (Crilly et al., 2004). Emotions may result from the radical change of these intangible attributes (Crilly et al., 2004). Thus, this study defines IoM in a narrow way as innovation of the meaning comprised in the symbolic aspect of a product.

Table 1. Three-dimensional segmentation of intangible attributes

	Aesthetic aspect	Functional aspect	Symbolic aspect
Crilly, Moultrie, & Clarkson (2004)	Aesthetic interpretation	Semantic interpretation	Symbolic association
Candi (2006)	Visceral design	Functional design	Experiential design
Rampino (2011)	Aesthetic	Of use	Meaning
Eisenman (2013)	Aesthetic information	Functional information	Symbolic information

Meaning and service

Users interpret products at two orders of meaning: first-order meaning and second-order meaning (Eisenman, 2013). First-order meaning refers to the immediate cognitive response to a product's appearance, and users compare the product to previous products, categorize, and understand it (Ulrich & Eppinger, 2004). A radical change in the product's appearance discourages users to evaluate its impact on their first-order meaning and elicits strong positive or negative emotion (Rampino, 2011). Meanwhile, second-order meaning results from longer psychological processes in which users analyse the products using their memory accumulated in their cultural backgrounds and social settings. This second-order meaning may be changed by additional information related to a product (Eisenman, 2013). Given that companies aim at guiding users to reconstruct intended meanings to radically changed product appearances, especially in the case of technology epiphany, the companies maintain direct interactions with them to offer the additional information in their dynamic reconstruction processes. Services may be one of the useful ways to guide them in reconstructing the second-order meaning because they can build long-term relationships between companies and users. Moreover, human-to-human interactions may be an opportunity to share the intended meaning with users.

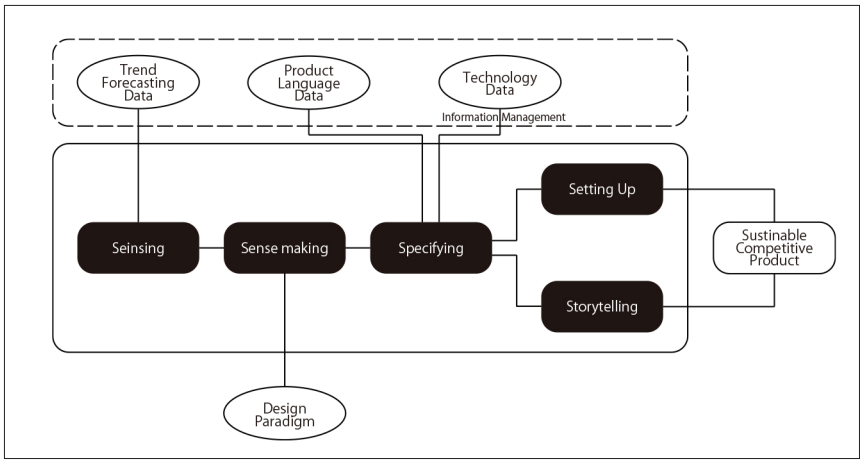
Dell'Era and Verganti (2011) noted that collaboration between producers within the same design discourse can help disseminate new meaning within an industry. Such collaboration helps a company that is developing new meaning to educate other companies about it; they communicate and share it during NPD. A service, on the other hand, is likely to offer to users education regarding a new meaning, because the company has an opportunity to communicate with users. Bellini et al. (2017) stressed that the meaning is affected by 'shopping experience', which is the multi-sensory interaction between consumers and salespersons that happens in the physical spaces of the store. Moreover, consumer engagement that refers to commitment, trust, self-brand connection, and loyalty occurs within the dynamic, iterative process inherent in a service relationship (Brodie, Hollebeek, Juric, & Ilic, 2011). Consumer engagement helps users co-create experience and value with companies. Above all, the service is likely to work as a way to affect the second-order meaning through the dynamic reconstruction process.

Research framework

Kembaren et al. (2014) suggested the conceptual framework of the process of DDI (Figure 1) and noted that storytelling has a strategic role to educate potential customers about a radical meaning.

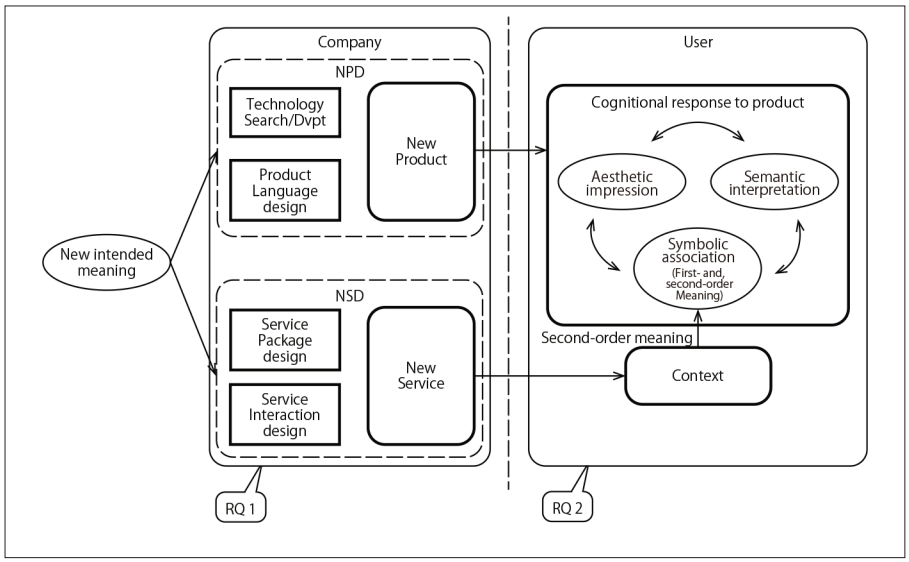
However, the storytelling does not accompany ongoing interactions with users and is, thus, likely to be the static for companies and customers. The process through which users reconstruct the intended meaning should be recognized as dynamic (Kazmierczak, 2003). In the dynamic process of cognitive response to an integrated product and service, product appearance is the first point of contact for users, making it usable as a stimulus to affect an ex-ante relationship quality, including affective variables such as trust, commitment, and satisfaction (Rha, 2012), because it can evoke positive or negative emotions in customers. Once customers experience a service encounter, companies can offer additional information related to products. Thus, they can affect second-order meaning in the context of use.

Figure 1. IoM (design driven innovation) process conceptual framework (Kembaren et al., 2014)



Based on the above literature review, the research framework is developed (see Figure 2). NPD consists of technology searching/development and product language design (Kembaren et al., 2014). Product language is defined as product appearance that conveys messages to users (Verganti, 2008). Meanwhile, NSD consists of *service package* design and *service interaction* design (Buganza & Verganti, 2005). Service package refers to the value the service delivers to users and service interaction refers to how it delivers value to them (Buganza & Verganti, 2005).

Figure 2. Research framework (Adopted from Kembaren et al., 2014)



This study specifically focuses on two aspects. First, the study focuses on how designers consistently develop a product's appearance and service for the reconstruction of an intended meaning. Some literature on product service-systems (PSS) has suggested the design methodology to develop an integrated product and service. For example, Maussang, Zwolinski, and Brissaud (2009) argued that using scenarios during the development process is useful for engineering designers to understand the contexts that different people have. Morelli (2002) insisted that linking several social and technological factors is required to generate new technological frames, and designers need to extend their role to achieve this. These researches implied that during the development process of an integrated product and service, to clarify an intended meaning, context is needed to achieve technology epiphany. Second, as mentioned above, intangible product

attributes result from users' cognitive response to a product's appearance in their contexts. Thus, this study also focuses on how products and services guide users to reconstruct intended meanings.

Research design

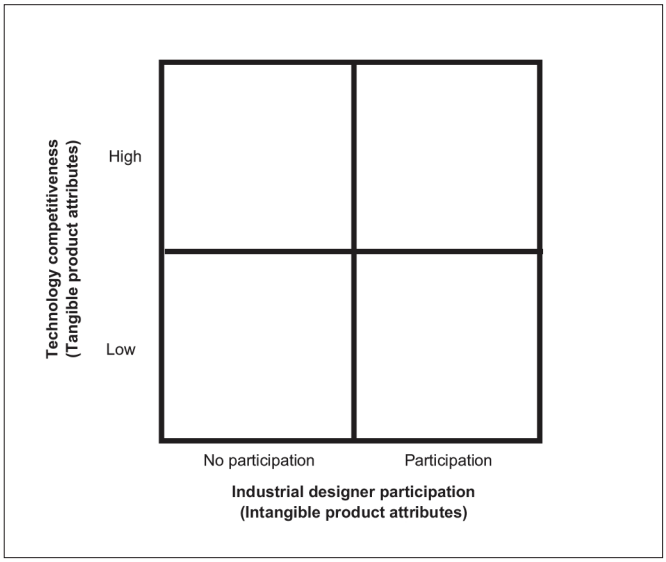
This study aims at answering two RQs, including the perspective of NPD and NSD and the perspective of the user's cognition process. We undertake an in-depth case study to appropriately to answer how or why in numerous levels of analysis (Yin, 1994)

When choosing appropriate and transparently observable cases, it is important to control for environmental variations (Eisenhardt, 1989). Therefore, we identified the common constructs of IoM. Tangible product attributes depend on technological features and social processes that surround their evolution (Pinch & Bijker, 1987). Crilly et al. (2004) implied that once tangible attributes are solidified, the emphasis might shift to intangible ones. Moreover, Eisenman (2013) mentioned that intangible product attributes extend a product's basic functionalities; he also suggested that when new products emerge, their appearance acts as a tool that explains to users what they do. The design of intangible product attributes concerns itself with creating a 'bridge' between technical possibilities and market opportunities (Candi & Samundsson, 2011). Therefore, having core technological competence is a basic competitive advantage.

Although the present study focuses on intangible attributes, it is difficult to evaluate their evolution, because they are very much contingent on customers' perceptions and interpretations. Therefore, this study refers instead to industrial designers' participation in new PSS development. Although the concept of industrial design has been defined in various ways (Verganti, 2008), it is agreed that it is responsible for a product's appearance and user-friendliness, among other things (Gemser & Leenders, 2001; Pedgley, 2009). Gorb and Dumas (1987) determined a process by which non-designers are engaged in design. Regardless of industrial designers' participation in this process (or lack thereof), customers have cognitive responses that are driven by their perception of tangible product attributes (Crilly et al., 2004). However, Verganti (2003) stressed that the designer's competence is useful in changing meanings through product appearance. Therefore, his/her participation must be considered when controlling for environmental variables.

In summary, the two dimensions inherent in selecting a case—technological competitiveness as a tangible product attribute and industrial designer participation as an intangible one—form the basis of our typology (Figure. 3).

Figure 3. The criteria of case selection



Case selection

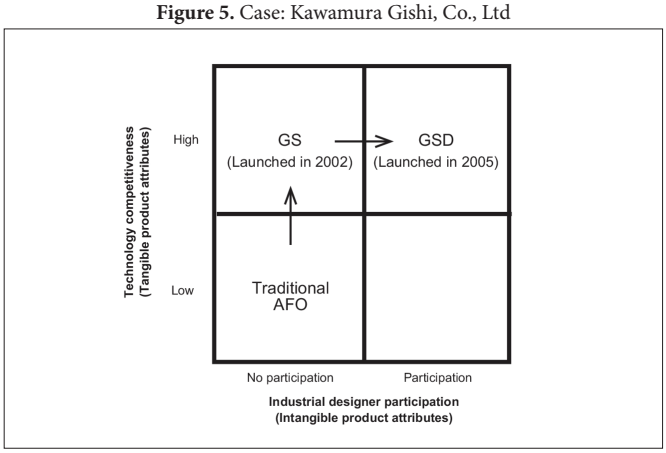
Next, we focus on a narrower investigation area to reduce industry bias. This study employs a case from the Japanese AFO industry. Most customers in this industry periodically obtain public financial assistance to buy or lease durable medical equipment (DME), including AFOs. Therefore, price-competitiveness in this market is no more important than in other industries. Once customers buy or lease the DME, they keep it for a certain period. Moreover, most of the Japanese AFO companies have not employed designers to enhance the hedonic value of their products. Therefore, an examination of this industry can reveal the effect of a designer's participation on new PSS development processes.

In this study, we analysed the case of Kawamura Gishi Co., Ltd., Japan's largest manufacturer of AFOs. Kawamura Gishi offers both products as well as rehabilitation and related services. The company developed an innovative AFO called Gait Solution Design (GSD) by leveraging high-technology competitiveness (Figure 4). Its most unique feature—a hydraulic damper that can be adjusted through the use of a single tool—provides only minimal gait support and has received significant attention in the field of orthosis therapy. Moreover, in the development of the integrated product and service, Kawamura Gishi employed a design firm that has won various design awards.

However, prior to the design firm's participation, the company had developed GaitSolution (GS), which has the same function (a hydraulic damper) with GSD and sold only 10 GS in a month units; after launching GSD, the total sales of GS and GSD exceeded 300 units in a month. This means that high-technology competitiveness was not a driver in generating profits, and GSD's designer's participation in the development process had an impact on the company's sales (Figure 5). Thus, the present study theoretically selects this case as one that achieves technology epiphany.

Figure 4. GS (left) and GSD (right)

Figure 5. Case: Kawamura Gishi, Co., Ltd



Data collection

This study combines data collected from multiple sources, interviews and archive sources. We conducted 14 semi-structured interviews at Kawamura Gishi and Pacific Supply Co., Ltd., a subsidiary company that carries other companies' products and services. Additionally, we interviewed the head designer at the design firm employed by Kawamura Gishi. Table 2 shows the profile of the interviewees. The interviews were conducted between June 2010 and December 2015; audio recordings of those interviews were captured, which were subsequently transcribed by two researchers.

Table 2. List of interviewees

ID	Person	Department	Company
1	Top executive	Management	Kawamura Gishi
2	Chief engineer	Development	Kawamura Gishi
3	Top executive	Management	Kawamura Gishi
4	Manager	Sales	Kawamura Gishi
5	Chief engineer	Development	Kawamura Gishi
6	Division manager	Sales	Kawamura Gishi
7	Manager	Manufacturing	Kawamura Gishi
8	Division manager	Marketing and sales	Kawamura Gishi
9	Top executive	Manufacturing	Kawamura Gishi
10	Chief engineer	Development	Kawamura Gishi
11	Top executive	Management	Kawamura Gishi
12	Chief engineer	R&D	Kawamura Gishi
13	Top executive	Wholesale	Pacific Supply
14	Division manager	Development	Pacific Supply
15	Assistant director	Design development	GK dynamics

Data Analysis

Technology search/development

An AFO is a device that assists hemiplegic patients who have an ankle disability. In the past, an AFO was primarily a special-order product that was adapted to a customer's body, after measuring his or her physical dimensions. More recently, the immediate use of an AFO following physical impairment has been considered desirable, given its medical benefits. Accordingly, there has been an increased need for standardized, off-the-shelf products; however, it can be difficult to customize an existing AFO, because a user's medical condition can change daily. As a result, there is increasing interest in standardized products that feature dimensions that can be adjusted in response to physical changes that occur after the product has been manufactured and delivered. In response to this interest, Kawamura Gishi decided to develop a new standardized AFO.

For the development of GS, Kawamura Gishi has employed a novel technology using which the academic researcher working on the AFO has already developed a prototype. This NPD has been funded by New Energy and Industrial Technology Development Organization (NEDO), which is Japan's largest public research and development management organization. GS has a unique oil damper to generate resistance to prevent excessive plantar flexion of the ankle joint and move freely to dorsiflexion, while the ankle joint of the traditional AFOs is rigid to stabilize the ankle and maintain clearance in swing. Moreover, GS's flexible design is such that as the user's medical condition changes, it can be adjusted. These novel functions of GS, however, have been considered beyond common sense in the industry. This is illustrated by the following quotation, from the chief engineer of the R&D division:

'When I presented this idea in an academic conference, most of the researchers and practicians condemned us. Moreover, the salespersons within the organization were unwilling to deliver it to customers.'.

Service Package Design

Traditional AFOs require maintenance and rehabilitation services to adjust in response to physical changes. In traditional AFOs, the strength of the braking force is changed by adjusting its material thickness or by trimming; fine adjustments are practically difficult. Such adjustments cannot be restored and depend on the tacit knowledge of servicepersons. GS, on the other hand, has a unique hydraulic damper that can be adjusted using a single tool; this can modify the strength of the braking force and the angle at which it takes effect. The novel technology enables the service to radically change. This is illustrated by the following quotation, from the chief engineer of the R&D division:

'In the traditional AFO, as prosthetists or servicepersons ask a doctor and a physical therapist about a user's physical condition and adjusted the AFO using their tacit knowledge. They ignored users' feedback. There were no evidences to evaluate the effects of adjustments and their adjustments could not compare with other cases…

I wanted the users to participate in the team for rehabilitation… I think an ideal rehabilitation service is based on a discussion in which users, doctors, physical therapist and prosthetists all participate. GS realizes such team rehabilitation service by offering the evidence to compare their physical conditions'.

Despite being a technologically innovative and novel service package, GS sales did not grow initially. NPD members thought that the failure of sales was caused by its product appearance, which did not differ from that of existing AFOs. This is illustrated by the following quotation, from the manager of the manufacturing division:

'The reasons for slow sales are its large size, how it makes wearing shoes difficult, and its low-quality aesthetics. '

The older-style model puts visual stress on users because the shape of the foot-ankle assembly necessitates that they wear custom-tailored shoes. Using an AP like an AFO and custom-tailored shoes makes one's disability visible to others (Correia de Barros, Duarte, & Cruz, 2011). For this reason, the traditional AFO elicits negative emotions from users. Thus, the NPD team of GS are determined to improve AFOs and to involve in the process an industrial designer, who has won various design awards such as the Red Dot Award.

Product Language Design

The development of GSD has been funded by NEDO again. The designer was involved in this NPD and initiated the development of the concept to change the changing users' cognitive responses. First, he focused on the users' cognition of rehabilitation, and he used a metaphor to transform its meaning. This is illustrated in the following quotation.

'I think of rehabilitation a sort of "sport", and an AFO is a piece of equipment used to promote exercise among users. I, therefore, want users to obtain a 'sporty' impression from the outward appearance of the AFO'.

Here, the designer uses a metaphor, in which rehabilitation is equated with 'playing sports' and an AFO with 'sports equipment'. The intangible product attributes involved are as follows.

Aesthetic Impression

The GSD has a titanium frame, and its shape resembles a streamlined skeleton. This material and shape helps express 'dynamic stability', which implies a sense of vitality. Biological forms that resemble human figures tend to attract and fascinate consumers (Chang & Wu, 2007). Moreover, colour is a factor that enriches the sensory experience and significantly affects human emotions (Da Silva, Crilly, & Hekkert, 2015). For this reason, the GSD is offered in three different colours (see Figure 2). The classic colour of the existing AFO (Figure 6) is ideal because it matches the skin tone of many people, and thus, camouflages the device. Then, to encourage users to 'show off' their new AFO, the designer gave them the opportunity to select their favourite colour.

Figure 6. Comparison of a classic AFO (left) and GSD (right)

Semantic Interpretation

Streamlining the foot-ankle assembly made it possible for users to wear a variety of shoes on the top of GSD. The shape is similar to a shoe innersole; this allows users to wear *their* shoes, rather than custom-made ones. Additionally, GSD is shaped like a sandal (Figure 5). A user can put the product on, without raising his or her foot, by tilting the frame forward and inserting the foot from the rear. Users can perceive GSD's ease of wear from its appearance, and this motivates them to wear their own favourite shoes with it. Moreover, material selection determines a product's range of function, durability, and user experience (van Kesteren, Stappers, & de Brujin, 2007). While the frame material of the existing AFO is plastic, the GSD designer selected titanium, which is not only lightweight and durable but also perceived by users as a strong material.

Figure 7. How to wear the GSD

Symbolic Association

AFO users require rehabilitation to improve their medical condition; this might involve unpleasant affective states (Markussen, 2009). The GSD designer, who has experience in designing sports equipment, wanted to portray this rehabilitation as 'playing a sport'; he encouraged users to evoke a 'sporty' impression via the GSD's physical appearance. Correia de Barros et al. (2011) noted that APs are associated with negative stereotypes, and they suggest that designers work on them to reduce the associated stigma. Design attributes allow users to categorize products (Eisenman, 2013). The GSD's aesthetic

impression and semantic interpretation work together to transform the user's categorization of the AFO and influence the social values it may connote.

Service Interaction Design

The product's appearance is the first point of contact with the users, and it should be used to attract them to the associated service. For users of the older-style AFO, the product was something they tried to hide, on account of social concerns (e.g., stigma). Consumers are motivated to avoid products that generate displeasure (Desmet & Hekkert, 2007). For these reasons, the very appearance of the AFO discouraged them from undergoing rehabilitation, and thus, impeded improvements to their medical condition. Therefore, the designer explored ways to transform users' negative emotions to positive ones and to motivate them to undertake rehabilitation. This chain of events is seen in the following quotation.

'The motivation of a user is an important factor in solidifying the commitment to rehabilitation. Design has the power to motivate users and help enhance their rehabilitation effect'.

GSD has an aesthetic appeal and highly practical qualities. It elicits positive emotional responses from users, and thus, acts as a cue in expanding their sphere of action and attracting them to the rehabilitation service. Additionally, the designer emphasized the need to visualize the effect of rehabilitation; this was seen with Nike+, which allows users to visualize the effects of their running. This is illustrated in the following quotation by the designer.

'A player's motivation to improve his or her ability is crucial to continue to train hard. In the case of rehabilitation, patients are not concerned about winning or losing. I think it is important to visualize effects of rehabilitation'.

Kawamura Gishi developed an interaction device as a service interaction that enables users to quantitatively understand their medical condition on the spot, called Gait Judge System (GJS). Kawamura Gishi also offered maintenance service, adjusting its material thickness or trimming the plastic body, with the traditional AFO and rehabilitation instructions using the adjusted AFO. Such adjustments cannot be restored and depend on the tacit knowledge of the serviceperson. This means that it is difficult for the users to understand the effect of rehabilitation. When users better understand their medical condition, they respond more positively to the ensuing rehabilitation program. Moreover, GJS urged to deliver the rehabilitation service by the rehabilitation team; this program comprised medicine, a rehabilitator, and a Kawamura Gishi serviceperson. GJS enabled them to plan the rehabilitation program based on quantitative evidences.

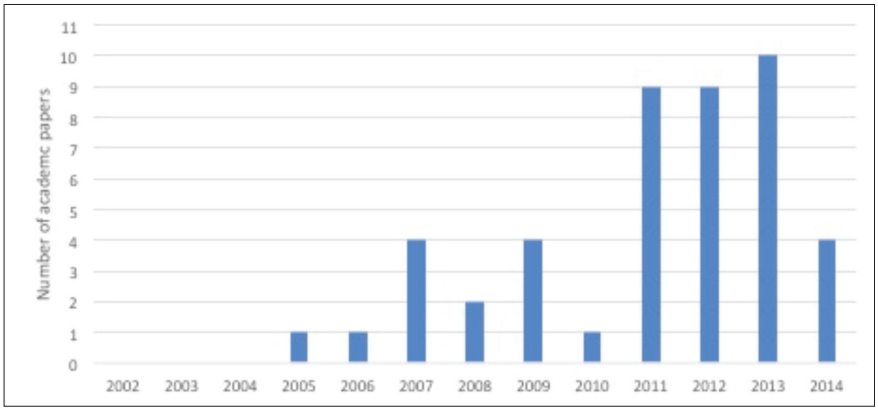
Technology Epiphany

GSD won the Red Dot Design Award and Japan's most prestigious design award (Good Design Award). The review committee of the Good Design Awards reportedly appreciated GSD as (1) having an innovative product concept, (2) a novel product form, (3) high competitive technology, and (4) a longer product life and ease-of-use. After launching GSD, the total monthly sales of GS and GSD exceeded 300 units. This is illustrated by the following quotation, from the manager of the manufacturing division:

'When we offer a novel product to consumers, we must properly explain its use. Above all, we learn that a welfare product must be one that encourage users to use...The diffusion of GSD makes us find other medical cases to which its broadly applicability is beyond our expectation'.

Moreover, Kawamura Gishi offered the information related to the technology of GSD on its website. It reported that the number of academic papers discussing the effect of GSD has increased in recent years (Figure 8) after launching GSD (November, 2005). This means that the novel technology is accepted by the society.

Figure 8. Number of academic papers

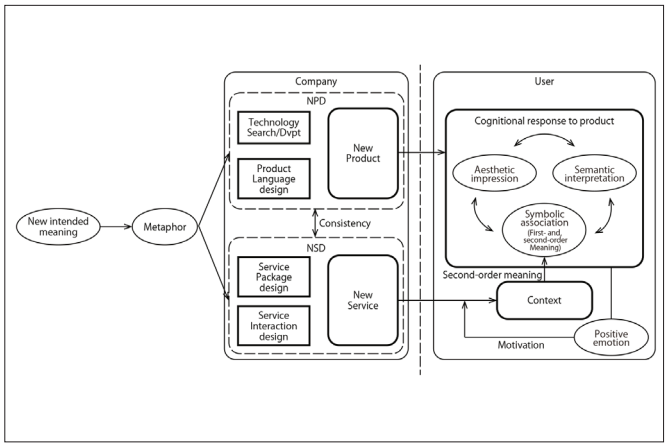


Discussion

A product's meaning for any given person is likely to be affected by that person's first-sight response to design attributes and from the longer-term psychological processes that subsequently ensue (Eisenman, 2013). GSD and the related rehabilitation service contribute to changing first- and second-order meanings. First-order meaning works as a categorical meaning at the user's first point of contact. Users categorize GSD as a piece of sports equipment, on account of its aesthetic impression and semantic interpretation. Moreover, the positive aesthetic impression and the ability to wear one's own favourite shoes release the product from what might otherwise be a negative societal connotation, and thus, help reduce user stigma (Correia de Barros et al., 2011). In this process, users associate with the self-expressive symbolism.

Moreover, the rehabilitation service offers the intended context in which users use GSD. GJS and the rehabilitation team work together to offer users the experience of improving their ability to walk. The store of experience with GSD works as a second-order meaning and helps in the dynamic reconstruction of interpreting GSD. In this process, the same product meaning is shared by the company and the product's users. As mentioned previously, Dell'Era and Verganti (2011) stressed that collaboration among companies helps in disseminating product meaning; in this case, instead of companies' collaboration, the service itself is useful in sharing product meaning with users. Figure 9 shows the comprehensive model developed in this study.

Figure 9. Research model



However, this exploratory case shows that even if the novel technology and service package is offered, the integrated product and service does not have the sales potential without the positive emotion that the product appearance elicits. GS's product appearance evoked negative emotion in users. This discouraged them to get the service. The company, as a result, could not offer additional information and experience to change the second-order meaning. Thus, this finding provides a better understanding of the importance of product language in the development of an integrated product and service. This study stresses that users make sense of a novel technology during their first contact with a product and a subsequent reconstruction process.

This finding also emphasizes on the consistency between the first-order meaning assigned to the product language and the second-order meaning that users reconstruct in the context. In this case, the designer used a metaphor—to use an AFO was analogous to playing sports. Existing studies show that metaphor usage is effective in conveying a specific meaning through product appearance (Crill, Moultrie, & Clarkson., 2004). Moreover, Zomerdijk and Voss (2011) suggested that metaphor usage can guide the development of experimental services. The current study finds that metaphor usage in developing an integrated product and service helps maintain consistency between the intended meaning assigned to the product language and the intended context offered by the service.

Verganti (2011, p. 367) emphasized that companies search for 'how a new technology enables the creation of products and services that are more meaningful for people'. This finding shows that customers accepted the novel technology when the product's appearance was changed, especially reducing the stigma and providing the unique rehabilitation service. As mentioned above, although provoking positive emotions is likely to be a key factor for the achievement of technology epiphany, only a few studies on integrated products and services have focused on it. For example, Stacey and Tether (2015) found that designers paid attention to the positive *emotional chain reactions* in the processes of new PSS development. This study also found that the designer drove the development of an integrated emotion-centric product and service in technology epiphany.

Conclusion

This study sought to answer RQs regarding how an integrated product and service contribute to achieving technology epiphany. The following are the three conclusions of this study:

- Positive emotions that product appearance elicits from users motivate them to get subsequent services.
- A service is an opportunity to share the intended meaning with users and guide them to reconstruct second-order meaning that a company intends.
- Using metaphors contributes to maintaining consistency between a product and service.
- A designer drives the development of an integrated emotion-centric product and service in technology epiphany.

Technology epiphany means that users give a novel meaning to a new technology (Verganti, 2011). The study emphasizes offering an integrated product and service is an effective way to achieve technology epiphany.

From a theoretical point of view, the comprehensive model has an implication for future studies. Barczac (2012) stressed that research regarding product/service hybrid offerings is an issue that might be interesting and useful for academicians to pursue. This study concludes that technology epiphany requires an integrated offering of a product

language as a first contact with users and a service as their dynamic reconstruction process. Traditionally, most studies have considered products separately from services. Although recent years have seen PSS, servitisation, or productisation (Baines et al., 2007), their studies have not focused on the perspective of IoM. The present model includes the intangible attribute as the key factor that promotes a deep understanding of the relationship between the integrated product and service and IoM. This implies that IoM is a synthesis of technology and service into new meanings. Moreover, this study contributes to the understanding of the designer's role in the development process of the integrated product and service. Many researchers emphasize on extending the role of designers in the process (Morelli, 2003). This study shows that technology epiphany results from collaboration between designers and other participants. Using metaphors is likely to be one of the ways to assist their collaboration.

From a practical point of view, the present model offers managerial guidance to design integrated products and services to elicit emotional satisfaction in users. Existing studies regarding integrated products and services have neglected factors related to emotions in their design methods. This exploratory case study showed that product appearance is an enabler to motivate users to use the service as well as convey the meaning as the product language.

This exploratory study develops a theory on IoM and an integrated product and service by combining observations from the existing literature and the chosen case study theoretically. Thus, it contributes to developing a better understanding of IoM. As a next step, future research may examine the theoretical model, especially the role of designers and the relationship between first- and second-order meanings using a large sample of data.

Biographical notes

Satoru Goto is currently an assistant professor at Toyo Gakuen University, Japan. He received his PhD in the Technology Management from Ritsumeikan University. He has an undergraduate degree and a master's degree in Science and Engineering from Ritsumeikan University. His current research interests are product-service systems and innovation of meaning. His articles have been published in the International Journal of Business and Systems Research (IJBSR). Further, he translated Design Driven Innovation, which was published by Robert Verganti in 2009, to Japanese.author:

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Prior Exposure and Educational Environment towards Entrepreneurial Intention

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Abstract: This research is based on the responses to a questionnaire applied to 351 students of business management in Chile and Colombia. Through the analysis of structural equations on Ajzen's model, we found that entrepreneurial education, the University environment, and the prior entrepreneurial exposure are mediated by the factors of the Ajzen`s model to generate entrepreneurial intention in higher education students. The results show that entrepreneurial education strengthens the perceived control of behavior and, with it, albeit in a differentiated way, the entrepreneurial intention of men and women. University environment affects entrepreneurial intention through attitude towards entrepreneurship; and finally, the work experience, used as one of the variables that measure prior entrepreneurial exposure, explains the entrepreneurial intention inversely through the subjective norms. We found that gender has a moderate effect on perceived control of behavior and entrepreneurial education. The scarce studies on the impact of the University environment and the mixed results of the entrepreneurial education and prior entrepreneurial exposure toward entrepreneurial intention show the necessity for further research. A second contribution is the opportunity to present new evidence about the relationship between University environment, entrepreneurial education and prior exposure to developing countries of South America, including the gender effect (moderator) for entrepreneurial intention. It is important to note that most of the research in this area applies to developed countries, and some scholars suggest that extrapolating the results is not convenient.

Keywords: entrepreneurial intention; prior entrepreneurial exposure; entrepreneurial education; higher education; Chile; Colombia.

Submitted: May 22nd 2017 / Approved: Jun 30th 2017

Introduction

The decision to create a new business relates to opportunity perception and entrepreneurial intention. Several researchers emphasize that entrepreneurial intentions represent a commitment of individuals to start a new business and that it becomes the first step toward entrepreneurial behavior (Krueger & Carsrud, 1993). The Theory of Planned Behavior (TPB) by Ajzen (1991) is one of the most used models of EI, and it has been applied as a theoretical framework to analyze the formation of intentions in various fields (Fayolle, 2013). The TPB model considers three attitudinal variables or dimensions that explain EI (i.e., personal attitude toward entrepreneurship (ATE), perceived behavioral control (PBC), and subjective norms, SN). In this regard, this study aims to understand the formation of intention in the field of entrepreneurship education using the Ajzen's model (1991) adding three exogenous variables: University environment (UE), entrepreneurial education (EE), and prior entrepreneurial intention (PEE).

The literature on EI has increased exponentially. Liñán & Fayolle (2015) analyzed a total of 409 papers published in Scopus database during 2004-2013 all related with EI. 61% of those publications are at most three years old. The growth in the number of EI publications reflects the interest that EI has generated in the research community worldwide. However, looking at emerging economies in Latin America, the literature on entrepreneurial intentions and related variables using the TPB model is still limited, and there is even less on students' entrepreneurial intentions from two different higher education institutions. This research considered the responses of 351 University students in the area of business management from two emerging economies in South America such as Chile and Colombia. The sample considers data from 245 students from the Universidad Católica del Norte (Coquimbo, Chile) and 106 students from the Universidad Piloto de Colombia (Bogotá, Colombia).

This paper seeks to contribute to two main points of interest. First, the research goes deeper on the study of the Ajzen's TPB. Specifically, this research includes three additional variables named above (UE, EE, PEE) that could show an indirect effect through EI. We propose that perceived behavioral control (PBC), personal attitude toward entrepreneurship (ATE) and subjective norms (SN) could be mediators. Specifically, University environment could affect ATE, entrepreneurial education (EE) is related to PBC, and prior entrepreneurial exposure (PEE) might impact SN, respectively.

Regarding the University environment, no further information was obtained. Related to institutional analysis, Walter and Block (2016) found that education for entrepreneurship has stronger relationships with subsequent entrepreneurial activity in seemingly entrepreneurship-hostile institutional environments. Most studies show a positive effect of EE on entrepreneurial intention; however, there is another group of research that found a negative, discouraging effect of entrepreneurial education.

In the case of prior entrepreneurial exposure, there are also inconclusive findings. In this study, the PEE is considered from two points

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of view as Zapkau et al. (2015) point out. First, the individual's personal history related to entrepreneurship such as parents, relatives, friends and colleagues, and second by prior experience working in a small firm. Some authors find entrepreneurial parents to stimulate children's EI, while others do not support this finding. Research on the impact of work experience is scarce and also with contradictory results towards the interest to start a new business.

On one hand, studies on the impact the University environment are scarce, and on the other hand the mixed results of the entrepreneurial education and prior entrepreneurial exposure toward EI need further research. This study addresses these gaps and explores if the University endowment, entrepreneurial education and, previous exposure to entrepreneurs and new firms activity, could affect the entrepreneurial intention indirectly. Therefore, the relationships found here could initiate further discussions.

A second contribution is the opportunity to present new evidence about relationship between University environment, entrepreneurial education and prior exposure for developing countries of South America including the gender effect (moderator) for entrepreneurial intention. Also, it is relevant to take account that most of EI literature has been done on developed countries, and some scholars suggest than it is not convenient to extrapolate results of developed countries to developing economies (De Vita et al., 2014). Drawing on TBP model by Azjen, this study contributes to extend the application of this model in entrepreneurship education research including UE, EE, and PEE as well as to reinforce the impact of Ajzen's variables through EI, respectively. Also this study contributes to test if prior results on developing countries coincide with this research results.

In summary, these results could clarify the contribution of Ajzen's TPB theory when explaining EI to the undergraduate students in the sample. This study extends the traditional TPB model of intention including three exogenous variables such as University environment (UE), entrepreneurial education (EE) and the prior entrepreneurial exposure (PEE) to look at the direct or indirect effects those might have on EI, including gender effect for entrepreneurial education.

Chile and Colombia are two emerging economies. Colombia has 48 million inhabitants, compared to 18 million people in Chile, about two and a half times. Taking into account the accumulated per capita GDP between 2008 and 2013 the difference is noticeable. The per capita gross domestic product of Colombia is about one-third of Chile's gross domestic product per capita; GDP per capita in Chile is around USD 23,500, while GDP from Colombia is USD 13,800. The annual unemployment rate has also a marked difference. For the same time period detailed previously, 2008 - 2013, unemployment in Chile stood at 7.6%, while in Colombia was 11.2% on average. In relation to the entrepreneurial activity, according to GEM 2015 data, the rate of entrepreneurial activity in the nascent stage (less than 3 months) was 16.5% and 15.6% for Chile and Colombia, respectively. While the early stage activity rate (TEA) reached 25.9% and 22.7% for Chile and Colombia, respectively.

It can be seen that each country has differences in size and economic indicators; however, in the area of business creation, according to the GEM, the indicators are quite similar and both have policies that encourage entrepreneurship, both in the educational and economic fields. Thereby its results motivated the analysis of the entrepreneurial reality of these Latin American countries, with differences in macroeconomics indicators.

The rest of the paper is organized as follows. The next section details the theoretical framework about EI, University endowment, entrepreneurial education and prior entrepreneurial exposure, as well as the detail of the hypothesis. The third section describes data, variables and methodology used during the investigation. The results and discussion are then presented. Finally, the conclusion and limitations of research are presented in the last one.

Theoretical Framework and Hypotheses

Entrepreneurial Intentions (EI)

The entrepreneurial intention (EI) is the first step toward entrepreneurial behavior (Krueger & Carsrud, 1993) and it plays an important role in the decision to create a new firm (Liñan and Chen, 2009;). In the literature, EI is determined by attitudes, and attitudes are affected by exogenous influences or determinants. Several scholars have recognized different determinants for EI including personal traits and situational variables. Among determinants of EI, we can find in previous research: entrepreneurship education (Fayolle, 2013), exposure to entrepreneurial activity (Krueger, 1993), and gender (Karimi et al., 2013). Those appear to be an important antecedent of EI and might have a direct or indirect effect on individual EI (Karimi et al., 2016). Indeed, there is another approach to research the link that individual character variables might have with those of the environment (Mueller & Conway, 2013; Liñán et al. 2011).

The Theory of the Planned Behavior (Ajzen 1991) contains three explanatory variables: attitude towards entrepreneurial behavior (ATE), subjective norms (SN) and perceived behavioral control (PBC). The TPB describes how behavior is formed and it has been widely applied in entrepreneurship research due to its powerful empirical results (Kolvereid, 1996; Krueger et al., 2000; Liñán, 2004; Liñán et al., 2011;). The central factor of the TPB is the individual intention to perform a given behavior (Karimi et al., 2016). The entrepreneurial models of intention that apply the TPB, hve become validated theoretical frameworks that have shown applicability in different contexts and settings (Fayolle & Gailly, 2013;). Kautonen et al. (2015) indicate that ATE, SN and, PBC typically explain 30%-45% of the variance in intentions.

Literature on entrepreneurship and TPB shows that the attitude dimension is a very important psychological construct that affects and predicts many behaviors. The more favorable ATE it should be expected that the EI's perform should be increased. Additionally, PBC is related with the election of an action than the individual thinks will be able to control and master. It could be said that PBC is similar to

self-efficacy of Bandura (1986) and is included in the model of Krueger (1993). Finally, the dimension of subjective norms are defined as individuals' perception about the values, beliefs, and norms held by the people whom they respect or regard as important and the individuals' desire to comply with those norms (Azjen, 1991).

So, the first group of hypotheses would be to verify the fit of TBP model and its antecedents considered in this research for undergraduates students of Chile and Colombia.

H1a: Personal attitude toward entrepreneurship positively influences EI

H1b: Perception of behavior control positively influences EI

H1c: Subjective norms positively influences EI

University Environment and Entrepreneurial Education

The model of Ajzen (1991) is a relevant tool to model the development of entrepreneurial intention through entrepreneurship education courses in the University context. Higher education institutions worldwide have become one of the major contributors to fostering entrepreneurial behaviors in potential entrepreneurs (Fayolle, 2013). Therefore, the main challenge for many universities is to become more entrepreneurial institutions in order to expand their entrepreneurial education and become part of the entrepreneurial ecosystem. Only few studies have analyzed the influence of the University environment on students' entrepreneurial intention (Fayolle et al., 2006). Guerrero et al. (2016) study the relationship between entrepreneurship environment at universities and regional competitiveness. They characterized the University environment (UE) using formal (attitudes) and informal factors (EE programs) that reinforce and support entrepreneurship inside the University. They found a positive and significant impact of the entrepreneurial University environment on the University`s entrepreneurial activity in all the tested samples. These results could be a possible explanation for the reason some universities are more entrepreneurial than others. And, therefore, it could be more interesting to test how institutional variables toward entrepreneurship inside universities such as the culture, structure, and resources might influence the dimensions of students' EI.

There is a great variety of studies relating to entrepreneurial education (Walter & Block, 2016; Liñán et al., 2011). Literature on entrepreneurship research and model of intentions shows that the TPB is also an appropriate assessment tool for measuring effectiveness in entrepreneurial education (EE), including external influences on entrepreneurship activity such as the type of EE course, pedagogical methods and learning objectives.

The TPB model has been verified in various developed countries over the past two decades (Fayolle & Gailly, 2015). However, very limited empirical research on the relationship between EE and EI has focused on developing countries. Fayolle et al. (2006) found that although EE has a strong and measurable effect on students' EI, it has a positive, but not significant one on their PBC. Finally, a study on Iranian students' entrepreneurial intentions at six Iranian universities found significant positive impacts on students' subjective norms and perceived behavioral control after participating in entrepreneurship courses (Karimi et al., 2016).

These findings contribute to the TPB and have implications for the design and delivery of entrepreneurship education (EE) in universities. Therefore, more research is needed to look at the different components of the EE programs including some environmental variables in order to explore their relationship and the effect they may have on the individual entrepreneurial intention (Fayolle & Liñan, 2013; Karimi et al., 2016).

With this background in mind we propose that University environment and entrepreneurial education affects positively but indirectly the interest of the higher educational students to start a new business. This suggests the following hypothesis for UE and EE.

H2: Attitude towards entrepreneurship mediates the impact of University environment through EI.

H3: Perceived behavioral control mediates the impact of entrepreneurial education through EI.

Gender

There is a growing interest in research focused in women entrepreneurship (Wilson et al., 2007; BarNir, Watson & Hutchins, 2011; Karimi et al., 2013; Mueller & Conway, 2013; Maes et al., 2014). Liñán & Fayolle (2015) found that 30 of 409 papers published between 2004 and 2013 (inclusive) linked with EI were related with gender issues.

The first contribution is from Wilson et al. (2007), who concludes that entrepreneurship education has a greater effect on female's self-efficacy and, through this, on EI. In fact, Kolvereid (1996), applying the TPB model, showed that gender influences self-employment intentions indirectly through its impact on attitude, subjective norms and PBC. So, the role of gender continues to be an area that could help to generate accurate entrepreneurial education programs to reduce the gender effect in the creation of new firms.

Additionally, Haus et al. (2013) conclude that women transform their intentions into action to a much lesser extent than men do. Evidence suggests that female students, compared with male students, have lower confidence in their business abilities (Wilson et al. 2007). Women also perceived their environment to be more difficult and they will likely have a lower sense of personal control over activities associated with entrepreneurial career than men (BarNir et al. 2011). It is worth noting a different impact in males and females on EI. Therefore, gender difference might be a sociocultural dimension that influences entrepreneurship (Karimi et al., 2013). This is the reason gender could be tested as a moderator for the three dimensions on the TPB model. Maes et al. (2014), conclude than women choose not to become entrepreneurs because they perceived lack of locus of

internal control or of self-efficacy. So, gender is assumed to also have a moderating effect on the impact of EI. Negative feedback about their entrepreneurial abilities could alter female student expectations with respect to their potential creation of a new firm more than in the case of their male partners.

Within the analysis, this study tested the moderating effect of gender on entrepreneurial education, perceived behavior control and entrepreneurial intention. So, we position gender as a moderator for the entrepreneurial education and its mediator toward entrepreneurial intention.

H4: Gender moderates impact of PBC towards EI

H5: Gender moderates the relationship between EE towards perceived behavioral control

H6: Males have more EI than females

Prior Entrepreneurial Exposure

Entrepreneurial role models can be seen as a possible source for entrepreneurship learning and inspiring students to become entrepreneurs (Karimi et al., 2013). Role models in entrepreneurship are considered as situational or sociocultural factors that could enhance the predictive ability of the traditional TPB model. Prior experiences in entrepreneurship might influence intentions indirectly through attitude (including social norms) and perceived behavioral control. Then, entrepreneurial role models or prior entrepreneurial exposure (PEE) influence entrepreneurship indirectly, because it must affect attitudes in order to affect intentions (Krueger, 1993).

Zapkau et al., (2015) argue that individuals with parents who have previously started a business display higher levels of entrepreneurial intention. Using the TPB model and adapting prior entrepreneurial exposure from Krueger (1993) they found that exposure to parental role models only positively influences the subjective norm, whereas it has no significant effect on either attitude or perceived behavioral control in regard to starting a business. Karimi et al., (2013) explored the effect of role models as a mediator on EI as well as the moderator effect of gender in EI into the TPB model. In their study among a sample of Iranian college students, they found that entrepreneurial role models influence indirectly students' EI through the antecedents (ATE, SN, PBC). No direct effect of role models on EI was found by the authors. These findings are consistent with previous research (Krueger, 1993); however, more research is needed to understand better the relationship between prior entrepreneurial exposure and entrepreneurial intention.

The last group of hypothesis expands the TPB with the incorporation of the prior entrepreneurial exposure measured in two domains: a) link with family and relatives entrepreneurs, and b) actual work experience. The PEE referred to the close owners of business is proposed as a variable mediated by subjective norms. That is, we argue that the fact of having been related to people who are founders and in charge of their own the business generates a positive indirect effect on the entrepreneurial intention.

On the other hand, prior work experience is more global. That is, we believe that young people who have entered the labor market, are different from those who have not. Therefore, this factor is considered as a moderator in general. The relationship proposed is a positive one, in the sense that higher educational students with work experience have a greater predisposition to create their own company in the future. Consequently, the hypotheses referred to the PEE are as follows.

H7: Subjective norms mediate the impact of prior entrepreneurial exposure (family and relatives entrepreneurs) through EI.

H8a: PEE (labor experience) moderates the relationship between University environment and ATE

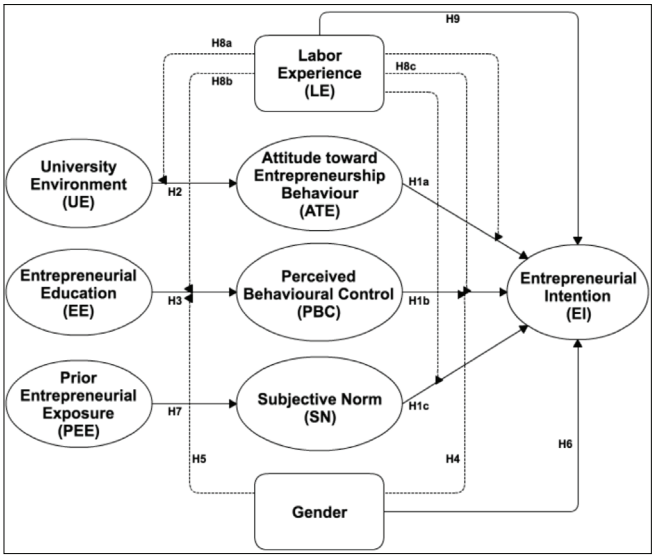
H8b: PEE (labor experience) moderates the relationship between entrepreneurial education and PBC

H8c: PEE (labor experience) moderates the relationship between ATE, PBC and SN towards entrepreneurial intention

H9: PEE (labor experience) affects the entrepreneurial intention.

So with the arguments above described, we aim in this research to propose the following conceptual framework and hypothesis. Figure 1 shows the conceptual model guiding this work and summarizes the hypothesis. This diagram illustrates the mediating effect that could have social norms (SN), perceived behavior control (PBC), and attitude towards entrepreneurship (ATE) on the decision to start a new business (EI). We also position some exogenous variables as mediators of the traditional TPB model of intention such as prior entrepreneurial exposure with entrepreneurs (PEE), entrepreneurial education (EE), and University environment (UE). Further, we position PEE (labor experience) as a moderator for the overall effect of entrepreneurial intention and gender as a moderator for EE and perceived behavior control.

Figure 1: Theoretical framework and study hypotheses



Materials and Methods

The data was collected from a survey of higher educational students in one University of Chile and Colombia from January to July 2015. The profile of the students who participated in the research was of business administration. A student sample is ideal given that they must make a decision regarding their future professional development; creating a company can be an alternative, as mentioned by Maes et al. (2014).

They were asked to complete a survey instrument via internet with a link to access the survey. The results are shown in Table 3. The sample consists of 351 effective responses, of which 245 are students from Chile and 106 from Colombia. Of the total sample, 43% students are men and 57% are women. Respondent's age ranges from 18 to 39 years, with an average of 21 years and a standard deviation of 3 years. It should be noted that 40% of students in Colombia are in an evening regime, which explains that the average age is higher (23 years), given that they are students of this system. 71 percent of Colombian and 56 percent of Chilean students indicated they had some previous work experience. Finally, 39 percent of Chilean students have a monthly family income lower than USD1000. So, the undergraduates in Colombia, in average, have a higher income. Only 12 percent of the sample has family income over USD1000. In Chile, 68 percent of the students' family income is lower than USD 2001, while in Colombia 40 percent of the students are in this range. 62% of students are between the first and second year of school. For the case of Colombian students, the highest proportion is in the first year (47%), while in the case of Chilean youth, the sample has 38% of students in their second year of studies in higher education.

In the total sample, 35% of the respondents indicated that they had no ties with owners and managers of companies with more than 5 workers. However, at the level of each country this figure is very different. For Chile, 43% of the students indicated that they had no relation with entrepreneurs, whereas for the case of Colombian students, this percentage is 16%. The young students indicate that close relatives are the most mentioned as entrepreneurial referents with an importance of 30%, very similar for each country (31% for Colombia and 29% for Chile).

Table 1: Characteristics of the sample

	Total	Chile	Colombia
Number of students	351	245	106
Gender			
Men	150	101	49
Women	201	144	57
Monthly family income			
Less than USD1000	31%	39%	12%
Between USD1001 and USD2000	29%	29%	28%
Between USD2001 and USD3000	17%	13%	25%
Between USD3001 and USD4000	10%	8%	15%
Between USD4001 and USD5000	5%	5%	8%
Between USD5001 and USD6000	5%	4%	6%
More than USD6000	3%	2%	6%
Labour Experience			
Yes	60%	56%	71%
No	40%	44%	29%
Entrepreneurial Exposure (founder or a company)			
Father/mother	19%	16%	25%
Brother/sister	3%	1%	8%
Close relatives	30%	29%	31%
Friends relatives	14%	11%	21%
Don't know anyone related to entrepreneurship	35%	43%	16%
University semester			
1^{st} – 2^{nd}	33%	27%	47%
3^{rd} – 4^{th}	29%	38%	10%
5^{th} - 6^{th}	16%	14%	21%
7^{th} – 8^{th}	13%	11%	17%
9^{th} -10^{th}	9%	10%	5%

The variables are measured in a Likert scale from one to five, where 1 indicates strong disagreement and 5 total agreement. In addition there are dummy variables. The survey is presented in the Appendix.

(1) Entrepreneurial Intention (EI): Dependent variable. It is constructed from a set of six phrases adapted from the instrument designed by Liñán & Chen (2009).

(2) Perceived Behavioral Control (PBC): This variable is based on a set of five sentences, taken from the instrument of Liñán & Chen, (2009).

(3) Subjective Norm (SN): This independent variable is measured on the basis of three questions concerning the relevance that has its immediate environment in relation to entrepreneurship. The questions were taken from the instrument of Liñán & Chen (2009).

(4) Attitude towards Entrepreneurship Behavior (ATE): This variable is measured through seven sentences, describing the attitude of the person in different circumstances. They are taken from the instrument created by Liñán & Chen (2009) and Lepoutre et al. (2010).

(5) Gender (GEN): Dummy variable, 0 for female, 1 for male.

(6) Prior Entrepreneurial Exposure (PEE): This variable is measured in two ways (observed and direct): a) link with people who are entrepreneurs (observational) and b) work experience (direct). The first one is an index that is obtained by a multiplication of two questions, one dummy and another percentage. The first question includes the identification of previous PEE antecedents based on six statements related to the link with people founder and owner of a company with more than 5 employees. This dummy is multiplied with the importance that each person gave the opinion of their close relatives or friends. The second one, labor experience, is a dummy variable: 1 if the person has prior work experience, 0 if the student doesn't have prior labor experience.

(7) Entrepreneurial Education (EE): This variable is measured through six sentences, describing the importance and how valuable was the course of entrepreneurial education. The affirmations were taken from Keat, et al., 2011

(8) University Environment (UNIV): This variable is measured through twelve sentences, describing the perception of the person in relation to the role of the University to promote entrepreneurial intention. The affirmations were taken from Keat, et al., 2011.

Results

A structural equation model (SEM) analysis by the method of partial least squares (PLS) was used to test hypotheses. The data obtained by the instrument described above were subjected first to a confirmatory factor analysis (CFA) using Lisrel package.

Table 2 shows the assertions that explain each of the latent variables. Questions not charged well for each construct were eliminated, leaving only those that altogether explain and have better fit indices. The results show acceptable composite reliability index (IFC) for each of the constructs, the same as the extracted variance (AVE). When analyzing goodness of fit index, it could be shown that the ratio Chi-square / degrees of freedom is acceptable, being well below 1.35.The maximum acceptable is 3. The same applies to the RMSEA 0.031 being well below the maximum acceptable 0.8 and NNFI, GFI and AGFI still all very close to 1.

Table 2: Confirmatory Factor Analysis

Constructs and ítems	Reability			Validity	
	T-values	IFC	AVE	standardized charges	Hair et al. (1998)
Entrepreneurial Intention (EI)					
EI1. I am determined to create a firm in the future.	16.19	0.77	0.53	0.77	0.72
EI4. I will make every effort to start and run my own firm.	12.08			0.61	
EI6. The likelihood that I will ever run my own business is very high.	16.91			0.79	
Perceived Behavioral Control (PBC)					
PBC1. To start a firm and keep it working would be easy for me	13.88			0.69	
PBC2. I can control the creation process of a new firm	17.10	0.79	0.50	0.81	0.68
PBC3. I know the necessary practical details to start a firm	9.75			0.52	
PBC4. It will be easy for me to develop a business idea	14.58			0.73	
Subjective Norm (SN)					
SN1. My close family think I should start a new company in the future.	5.56	0.84	0.72	0.91	0.85
SN2. My best friends think I should start a new company in the future.	9.47			0.78	
Attitude towards Entrepreneurship Behavior (ATE)					
ATE1. Being an entrepreneur implies to me more advantages than disadvantages.	15.46			0.76	
ATE2. A career as entrepreneur is attractive for me.	19.64	0.86	0.60	0.85	0.77
ATE3. If I had the opportunity and resources, I would like to start a firm.	20.74			0.89	
ATE5. Among various options, it would entail great satisfaction for me.	11.04			0.56	
Entrepreneurial Education (EE)					
EE1. Knowledge about the business environment.	20.94	0.94	0.83	0.89	0.91
EE4. The skills needed to be an entrepreneur.	23.26			0.95	
EE6. Detection of business opportunities.	21.62			0.91	
University Environment (UE)					
UE1. The University is an ideal location to learn about starting a business.	14.75			0.72	
UE3. Business examples are included in classroom teaching.	16.15	0.85	0.58	0.79	0.76
UE4. In college, students are encouraged to pursue business ventures.	15.98			0.78	
UE7. Received entrepreneurship education prepare people well for the creation of a company	16.45			0.77	
$\chi 2(137)=185.1$, p=0.00479 ; RMSEA=0.031 ;SRMR=0.034 ;NNFI=0.9907 ;CFI=0.9926 ; GFI=0.9477 ;AGFI=0.9274					

Table 3 shows the correlations of each construct with others. It can be seen that the most intense relationships between different constructs are: EI with the ATE with close to 76% levels: followed, by PBC with ATE with a correlation value of 66%. The relationship between gender with University environment and entrepreneurial education are negative; it emphasizes that the relationship between gender and ATE is the lowest.

Table 3 Item- Construct Correlations

	EI	PBC	SN	ATE	GEN	PEE	EE	UNIV
EI	1							
PBC	0.645	1						
SN	0.571	0.515	1					
ATE	0.765	0.657	0.538	1				
GEN	0.032	0.006	0.011	0.001	1			
PEE	0.198	0.163	0.243	0.185	0.013	1		
EE	0.182	0.175	0.127	0.176	-0.0961	0.020	1	
UE	0.168	0.219	0.154	0.208	-0.117	0.110	0.444	1

After evaluating the reliability of the variables and identifying each of the constructs with their respective items, it proceeds to use SEM for EI models. In Table 4 we can see the results for TPB of Ajzen (Model 1) for the total sample. It can be observed that for the standard model, all variables are significant at the 99 % confidence level, therefore ATE, PBC and SN explain the entrepreneurial intention of students surveyed, so it can support hypotheses H1a, H1b and H1c. Besides, of all variables considered to extend the Ajzen model, PEE (labor experience) is the only variable that proves to be explanatory for EI at 95% confident; so, H9 is confirmed. The result is to pay special attention because the relationship is reversed; young college students with working experience, would be less interested in starting their company in the future. These results complement the findings of Zaptan et al. (2015), who also studies work experience as an explanatory variable for the three variables of the Ajzen model. They reject the hypothesis that work experience perceived as positive, increases entrepreneurial intention. Finally, as Model 1 shows, gender has no direct effect on entrepreneurial intention, so H6 is rejected.

Table 4: Regression results

	Model 1 EI	Model 2 ATE	Model 3 PBC	Model 4 SN
Main effect				
Attitude Toward Entrepreneurship	0.5377***			
Perceived Behavioral Control	0.1842***			
Subjective Norm	0.1743***			
University Environment	-0.0386	0.2081***		
Entrepreneurial Education	0.0438		0.1817***	
Prior Entrepreneurial Exposure	0.0291			0.2433***
Interactive effect				
Attitude Toward Entrepreneurship*Gender	-0.0386			
Perceived Behavioral Control*Gender	0.0841**			
Prior Entrepreneurial Exposure*Gender		0.0197		
Entrepreneurial Education*Gender			0.0901	
University Environment*Gender				0.0855
Attitude Toward Entrepreneurship*LE	0.0389			
Perceived Behavioral Control*LE	0.0463			
Subjective Norm*LE	0.0602			
University Environment*LE		0.0522		
Entrepreneurial Education*LE			0.01408	
Prior Entrepreneurial Exposure*LE				-0.0061
Gender	0.0287	0.0078	0.2610	
Labol Experience	-0.0856**	0.0503	0.1103**	0.0279
Sobel Test SN	3.1783***			
Sobel Test PBC	2.7278***			
Sobel Test ATE	3.7507***			
Adjusted R Square	0.6499	0.0513	0.0391	0.4292
F	70.35***	7.315***	4.71***	6.23***
*** p<0.01, ** p<0.05	70.35***	7.315***	4.71***	6.23***

The research of Guzmán-Alfonso & Guzmán-Cuevas (2012) measured the model of Ajzen (1991) for Latin America. Their results are consistent for the case of ATE and PBC variables. However, in the case of subjective norms they found an inverse relationship to the IE.

The basis for this study model presents three variables that are mediated by the variables of the classical model of Ajzen (ATE, PBC, SN). The observed results show that the variables included in this framework (University endowment, entrepreneurial education and prior entrepreneurial exposure) have no direct effect on EI, as can be seen in Model 1, where none of these is significant, but they have an indirect effect through the variables of the classical model, which is seen in the last three models. In those, each of these variables is significant with respective variable at 99% confidence level. Also, the change of the coefficients produced by this mediator effect is significant by the Sobel test, which notes that all three have a 99 % confidence. This result gives support to the H2, H3 and H7 hypothesis. So, each of the variables linked to Ajzen's model explains its respective mediator. These argue that the University environment affects indirectly the entrepreneurial intention through the attitude toward entrepreneurship. Likewise, entrepreneurial education impacts on the IE indirectly and positively through perceived behavioral control, and finally the prior entrepreneurial exposure (link with entrepreneurs) empowers the interest to create a company through subjective norms. The next table resumes the results related with variables than explain de entrepreneurial intention for an extended model of TPB.

Table 5: Results of Global Model for Entrepreneurial Intention

Model	Hypothesis	Relationship	Finding
1	H1a	Actitud Toward Entrepreneurship => EI	Confirmed
1	H1b	Percieved Bebavioral Control => EI	Confirmed
1	H1c	Subjective Norms => EI	Confirmed
2	H2	University Environment => ATE	Confirmed
3	H3	Entrepreneurial Education => PBC	Confirmed
1	H6	Gender => EI	Rejected
4	H7	Prior Entrepreneurial Exposure => SN	Confirmed
1	H9	Laboral Experience => EI	Confirmed

Model 1 shows the gender and prior entrepreneurial experience (working experience) as a variable moderator for the explanatory variables of entrepreneurial intention. The results show that gender is a moderator for perceived control behavior with 95% confidence, which explains that if a man perceived behavioral control is enhanced, positively affecting the relationship with the entrepreneurial intention, checking the hypothesis H4. The results for all the moderation effects and their respective hypotheses could be seen in the table 6.

Table 6: Results of Moderation Effects

Model	Moderator	Hypothesis	Relationship	Finding
1 y 2	Gender	H4	Percieved Bebavioral Control => EI	Confirmed
1 y 3	Gender	H5	Entrepreneurial Education => PBC	Rejected
1 y 2	Laboral Experience	H8a	University Environment => ATE	Rejected
1 y 3	Laboral Experience	H8b	Entrepreneurial Education => PBC	Rejected
1 y 2	Laboral Experience	H8c	Actitud Toward Entrepreneurship => EI	Rejected
1 y 3	Laboral Experience	H8c	Percieved Bebavioral Control => EI	Rejected
1 y 4	Laboral Experience	H8c	Subjective Norms => EI	Rejected

Discussion

The results indicate that the Ajzen´s model fits perfectly to explain IE in Chile and Colombia (H1a; H1b and H1c). Our results are similar to the revised model shows that better explains Ajzen IE (Maes et al., 2014; Valencia et al., 2015; Lanero et al., 2015; López Vidal, 2013). It is interesting to note that IE literature includes studies where SN does not appear as significant. Such is the case of the research group as results shown by Ruizalba et al. (2015). Garcia-Rodriguez et al. (2015) show that in context of less economic development, the role of SN (perceived social pressure) to carry out or not a new firm loses its capacity to EI.

Despite proven empirically that the model explains the IE Ajzen University students in Chile and Colombia, it is not able to verify that gender plays a moderator role on EI. That is, no significant difference found in the IE of men and women as Wilson et al. (2007) and Mueller and Conway (2013) did for American students. This contrasts with results found by Díaz & Jiménez (2010), and Maes et al. (2014).

The results show that the moderating effect of gender is given on PBC and EE, being a significant effect on entrepreneurial education at 95%. This result could be compared with other related. First of all, the results are interesting in the sense that the impact of skills on the intention to develop a new company is different for men than for women. In general, women tend to think they have a lower self -confidence to run a business. While on the other hand, men tend to be overconfident about their performance. However, this fact is not necessarily related with more success on EI (Díaz & Jiménez, 2010). Sánchez Escobedo et al. (2014), emphasize that for the perception of self-efficacy, gender differences have been discovered, with the variable being significant for men in efficiency and innovation driven countries, which is not the case of Chile and Colombia. Karimi et al. (2013), also using TBP, explored the effects of gender and role models on EI. They found an opposite result, that is to say, no gender differences in the relationship between PBC and EI. Entrepreneurship is considered a male domain. So, more studies could be made related to this construct to go deeply and discover if men have a major optimistic ATE.

Nevertheless, the moderating effect of gender on entrepreneurial education is an interesting result. This becomes important if we take into consideration that there are studies whose findings indicate that women have to minimize their capacity to generate a business. They tend to attribute their success to external variables (external locus of control) than their own skills or effort (Verheul et al., 2012). In this regard, it is important to find that gender makes differences in the impact of EE on the perceived behavioral control. Programs that seek to enhance the EE should take into account that there is a differentiated view for males and females. So, the University and their entrepreneurial programs should take this information in order to motivate young people to start a new company. It becomes necessary to enhance women's own skills, increase their self-confidence and enhance their view on the cost - benefit assessment between becoming an entrepreneur or be an employed dependent.

In relation to the impact of the previous experience, a double impact could be verified. Firstly, that exposure to close entrepreneurs indirectly affects the entrepreneurial intention through subjective norms and, on the other hand, previous work experience directly and inversely affects the entrepreneurial intention. Consequently, it can be affirmed that the observation of the entrepreneurial activity in people close to the youngsters increases the interest to create companies. In this sense, given these results, it can be very interesting to incorporate into the entrepreneurial education activities that allow students to interact with entrepreneurs so that they can see everything that implies being an entrepreneur and perhaps lose the fear of undertaking. The results of this research are in the same line as those of Bosma et al. (2012), Tarling et al (2016) and Branir & Hutchins (2011). Bosma et al (2012) point out that 54% of the entrepreneurs they analyzed stated that they had a link with them and 80% stated that they would not have undertaken without such support; It also indicate that they are the close referents who achieve the motivation to undertake, not those that come out in the media. On the other hand, Tarling et al. (2016) and BarNir, Watson & Hutchins (2011) also find that there is a positive influence of families to become an entrepreneur.

Work experience was the other variable used to measure the prior entrepreneurial exposure, which is more direct. The results found indicate an inverse relationship between work experience and entrepreneurial intention. This fact is no less important, given that the results suggest that once young people are linked as dependent workers they are no longer interested in creating their own company in the future. With this, work experience would be an inhibitor of entrepreneurial intention. This can be explained, because students may find it more comfortable to be dependent, thus losing their enthusiasm for being their own future boss or for generating employment. This theme is interesting to address since increasingly a large number of students share their student work with a job. If this is accentuated, it could diminish the entrepreneurial intention and with it the entrepreneurs and the emergence of new companies. Undoubtedly, this motivates to continue deepening the analysis in the sense of looking for entrepreneurs by opportunity. Perhaps the work filters the young people, with which the entrepreneurial education and the University environment must play an important role to empower students who want to develop their company by chance and with innovation.

Conclusion

Based on information collected for students of business management from two Latin American universities, the study shows that the Ajzen's model fits well de EI for those young people. The tree variables incorporated to the model of Ajzen, University endowment, entrepreneurial education and prior entrepreneurial exposure, showed that have and indirect effect through EI: UE affects EI through attitude towards entrepreneurship; EE makes the same indirect impact through perceived control of behavior and finally, PEE affects EI toward subjective norms. The findings for gender are that there is a moderate effect for PBC and entrepreneurial education.

Gender proved to be a moderator for the relationship between entrepreneurial education, which opens a line of research related to generating differentiated pedagogical strategies for men and women. With this, another field that remains open for future study has to do with the best strategies of entrepreneurship teaching for males and which for females.

Another interesting result is that the work experience used as one of the variables that measures prior entrepreneurial exposure, explains the entrepreneurial intention in an inverse way. That is, young people who have worked in a company of more than 5 workers, are less motivated to create their own company in the future. This fact turns out to be interesting and it allows continuing investigating on the reason why the dependent work inhibits the enterprising intention and with her the potential emergence of new companies.

Besides the interesting results discussed above, we have to recognize some limitations of this research. The type and size of sample may have been constrained in this study. In each country the sample contains students from a single University in each city. However, given the limited number of studies on EI in Latin American countries, our investigation may motivate researches to analyze different types of entrepreneurial education to fit the requirements for male and female, or the impact of public policies and entrepreneurial education also in other countries of this part of the world.

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Appendix: Entrepreneurial Intention Questionnaire

Indicate your level of agreement with the following statements from 1 (strongly disagree) to 5 (strongly agree)

Entrepreneurial Intention (EI)
EI1. I am determined to create a firm in the future.
EI2: I am saving money to become an entrepreneur.
EI3. My professional goal is to become an entrepreneur.
EI4. I will make every effort to start and run my own firm.
EI5. After finishing my studies, I would like to work in an established company.
EI6. The likelihood that I will ever run my own business is very high.

Perceived Behavioural Control (PBC)
PBC1. To start a firm and keep it working would be easy for me
PBC2. I can control the creation process of a new firm
PBC3. I know the necessary practical details to start a firm
PBC4. It will be easy for me to develop a business idea,
PBC5. If I tried to start a firm, I would have a high probability of succeeding

Subjective Norms (SN)
SN1. My closest family thinks I should create a new firm in the future.
SN2. My best friends think I should create a new firm in the future.
SN3. My colleagues think I should create a new firm in the future.

For you, how important is the opinion of …? (Four scale : 25% - 50%- 75% and 100%)
1. Your family
2. Your Friends
3. Your colleagues and companions

Attitude Towards Entrepreneurial Behaviour (ATE)
ATE1. Being an entrepreneur implies more advantages than disadvantages to me.
ATE2. A career as entrepreneur is attractive for me.
ATE3. If I had the opportunity and resources, I'd like to start a firm.
ATE4. Being an entrepreneur would entail great satisfactions for me.
ATE5. Among various options, would entail great satisfaction for me.
ATE6. Entrepreneurs are job creators.
ATE7. Entrepreneurship is the basis of wealth creation, benefiting us all.

University Environment (UE)
In relation to the role that the university has to promote entrepreneurship …
UE1. The university is an ideal location for learns about starting a business.
UE2. More entrepreneurship and business educational programs on campus would help students to start businesses.
UE3. Business examples are included in classroom teaching.
UE4. In college students are encouraged to pursue business ventures.
UE5. The university infrastructure and policies encourage entrepreneurship.
UE6. People are actively encouraged to pursue their own business ideas.
UE7. Received entrepreneurship education prepares people well for the creation of a company
UE8. The student clubs on campus which promote entrepreneurship.
UE9. A creative university environment inspires me to develop ideas for new business.
UE10. Entrepreneurial activities are limited only to business students.
UE11. Entrepreneurship courses should be made compulsory in order to stimulate entrepreneurial spirit in campus.
UE12: The university should provide resources to assist student entrepreneurs.

Entrepreneurial Education (EE)
To what extent do you consider that this course or module helped you to develop the following aspects:

EE1 Knowledge about the business environment.
EE2 Increase de positive recognition of the entrepreneur
EE3 The preference to become an entrepreneur
EE4 The skills needed to be an entrepreneur.
EE5 Entrepreneurial intention has been raised
EE6 Detection of business opportunities.

Prior Entrepreneurial Exposure (PEE)

Role Models
Antecedents of entrepreneurship (can mark more than one alternative)

Father is founder and owner of a company with more than 5 employees
Mother is founder and owner of a company with more than 5 employees
Brother or sister is founder and owner of a company with more than 5 employees
Relatives are founders and owners of a company with more than 5 employees
Close friends are founders and owners of a company with more than 5 employees
No one you know of has been a founder neither owner of a company with more than 5 employees

Work Experience (Dummy)
Have you had any kind of work experience in companies with more than 5 employees during your university studies? (Yes/No)

ISSN: 0718-2724. (http://jotmi.org)

Open Innovation Practices in Strategic Partnerships of Cloud Computing Providers

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Abstract: The open innovation states that companies can and must use the available resources outside their boundaries. This combination of ideas aligned to the internal and external technologies are crucial to reach a leadership position. The present study aims to identify the practices of open innovation along the partnerships between providers of Cloud Computing. Social Network Analysis were used in the research. Data was collected through questionnaires secondary sources. The companies were asked to identify their strategic partnerships and to identify and characterize the practices of Open Innovation they actually use. Of the 26 strategic partnerships mentioned, only 11 were characterized as practices of the Open Innovation.

Keywords: Innovation Management; Open Innovation; Collaboration; Cloud Computing Providers.

Submitted: June 1st 2017 / Approved: July 10th 2017

Introduction

Even though the Open Innovation concept is relatively recent, Chesbrough (2003; 2007) draw up this theory from several concepts developed in the 1980s and 1990s, namely the concept of complementary assets (Teece, 1986). The main idea is that the success of an innovation strategy not only depends on the innovation capacity, being strongly determined by a set of infrastructures and capabilities enabling the commercialization success and the diffusion of the innovation on the market. However, the innovator does not always control these complementary assets, being necessary to form partnerships with other organizations (Rothaermel, 2001).

The Open Innovation literature increasingly refers to the analysis of the collaborative processes of companies (Lee et al., 2010; Enkel & Gassman, 2007) evidencing the approach of the themes of collaboration networks in the context of the open model. The authors consider the existence of collaboration as a synonym for the adoption of Open Innovation models. But will it always be like this?

This study aims to contribute to tackle three gaps identified in the extant literature: 1) The need for studies addressing the adoption of the open model in information technology firms; 2) The existence of few studies on adoption of Open Innovation practices in small and medium enterprises (SMEs); 3) The shortage of studies in the context of follower countries (countries outside the technological frontier). Therefore, this study empirically assesses the use of Open Innovation Practices in strategic partnerships of small and medium cloud computing providers located in a technological park in Brazil. The following research questions were raised: Which are the Open Innovation practices adopted by companies in development and diffusion of services based on cloud computing? Are partnerships established by these cloud providers in fact Open Innovation practices?

From Closed Innovation to Open Innovation

The recognition of the role of different sources of knowledge and innovation, within and outside firms, is not recent (von Hippel, 1986). For example, Napolitano (1989) states that companies may innovate from own (internal) resources (e.g. internal R&D, process and product engineering and contribution of collaborators) and external resources (technology acquisition, raw materials and intermediate products, relationships with customers and suppliers, observation of competitors, interaction with universities, search of patents and scientific publications databases, etc.).

The literature also refers the necessity of matching these different sources (internal and external) of knowledge and innovation, as outlined by the absorptive capacity literature (Cohen & Levinthal, 1989; 1990). For them, the innovation strategy success is associated with the capacity to recognize the value of the new knowledge, and to assimilate and commercial apply it. Thus, one of the main merits of the Chesbrough´s Open Innovation concept is to highlight the increasing firms' acceptance of the innovation strategies based on this "openness", as well as the development of an analytical framework, enabling to relate and to integrate important concepts to the innovation management literature that were previously dispersed. Gassmann, Enkel and Chesbrough (2010, p. 215) note the diversity of the areas in which this theme is gaining momentum: "Today, open innovation has changed its status from the research interest of a few to a mainstream research area. Initiated by scholars in the field technology and innovation management, it is currently often also cited in strategy, general management and organization behavior journals".

The open innovation model contrasts with the closed innovation model, in which competitive advantages are directly related to the existence of sophisticated R&D laboratories and high investments in

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ISSN: 0718-2724. (http://jotmi.org)

infrastructures and activities. This was the common way to reach new discoveries and to get leading positions in the market (Chesbrough, 2003; 2004; Gann, 2004; Smith, 2004; Hemphill, 2005; Blau, 2007).

Meanwhile, throughout the last decades, several unsuccessful business cases of firms with strong R&D capacity have been exposed. From the current comprehension on innovation management practices, it is possible to list some misconceptions of the innovation process carried out by managers over the years. An example is the case of the Xerox Corporation and its Palo Alto Research Center (PARC) that has a robust internal R&D structure. For many of the valuable innovations developed there, the company did not identify a commercial application. This lack of use of innovations generated internally is avoided in the open innovation model, because they could have been employed as a strategic asset and commercialized (Chesbrough, 2003). The experience of Procter & Gamble demonstrates this fruitful situation: the ideas generated in their laboratories, which are not applied internally, are put on hold during three years, and, if after this period, they are not being employed internally they will be sold to other firms

Networks and Open Innovation Management

The Open Innovation model is based on the idea that the creation of large internal R&D centers is an obsolete strategy, being the combination of both internal and external knowledge sources vital for the success of the innovation endeavor (Chesbrough, 2003). The company needs to define which internal resources are used and which external interactions will be developed using collaborations, alliances, spin-offs or licensing. This is particularly the case of SMEs, due to the complexity of the innovation process (Zeng, Xie & Tam, 2010).

The growing openness of corporate innovation strategies reflects on the increased formation of alliances and networks. In the Open Innovation process, partners can be other firms (customers, suppliers, competitors), research organizations (universities and research centers) or public entities. According to Chiaroni, Chiesa and Frattini (2010) empirical evidence suggests that the implementation of the open model depends on the establishment of inter-organizational networks with the presence of several types of actor: universities, research institutes, suppliers, customers, etc.

In a recent analysis focused on 137 manufacturing SMEs located in China, Zeng, Xie and Tam (2010) explore the various innovation networks, and their relationship with the firms' innovation performance. Their results show a positive correlation between the cooperation with other enterprises, with research organizations and with intermediary institutions, and the performance of SMEs. However, cooperation with government agencies does not appear to have a significant impact on the innovation performance of SMEs.

Moreover, Laursen and Salter (2006) identify two important variables in the process of composition of the networks: i) the magnitude of the demand to integrate actors, determined by the number of channels used by the company; and ii) the depth of search for potential partners to form a network, determined by the formation of a diverse network of actors. These variables are crucial for the formation of networks and consequently assist in the adoption of the Open Innovation model by companies, recognizing the absorption of knowledge as a driving motivation for collaborative work.

In this context of increasing networking, the design and implementation of innovation strategies raise new challenges related to the choice of partner's, and the setting goals for partnership and ownership of their results. Vanhaverbeke et al. (2012) systematized these challenges in the following rules:

1. The selection of the right or more appropriate partners is crucial, because the Open Innovation requires the sharing of risks, time and investment, making important a clear and even division of duties and benefits.

2. The company that proposed the joint development – central company – usually manages the network, in order to ensure the harmony of interaction.

3. The survival of the partnership is conditioned to the partners' motivation. It is claimed that the firms' innovation network needs to be constantly maintained active. Therefore, it is important to maintain the partners' enthusiasm and instigate new challenges.

4. Network management (Rule 2) also implies that the central company discerns partners who are not acting according to what had been agreed. Those that are not complying with the rules previously established must leave the network.

5. The openness in communication and in reporting among network partners, associated with the trust factor, is central to the success of the partnership.

6. Manage the balance between the company's internal management and the external management of the network.

7. The interaction between the partners becomes easier to manage if they have similar goals, ambitions and size. SMEs often fear to interact with large firms and this fact often hinders trust between partners.

8. The Open Innovation management also involves controlling costs. In an innovation network, the various partners may be working in a specific task. The central firm has to keep the overall cost under control.

9. Document and record every activity of the project are also tasks for the firm responsible for managing the network. Over time, the central firm will have a deeper understanding of the competencies of each partner that can facilitate the management of that network or of other future networks.

10. Lastly, manage tensions and problems proactively. Open communication and follow-up meetings can avoid such situations.

Therefore, these challenges point to the need to organize the interaction with the external environment and strengthening collaboration network management capabilities. The identification of key partners for the projects is an important competence of the company, as well as having the maturity to partnership with external stakeholders and managing the collaborative process. The continuous evaluation of the network may change future business strategies, namely directing efforts to the processes where the firm has expertise and knowledge, and getting out partnerships cease to be strategic (Dittrich & Duysters, 2007).

Such collaborative environment has also influenced the public financing policies of several countries, favoring programs for collaborative projects between universities and companies, as well as agreements between countries. As mentioned by Valk, Chappin and Gijsbers (2011, p. 25) "(...) in a recent Policy Brief of the OECD, the potential for innovation depends on how well knowledge circulates and how well the system is connected: policies to foster or enable the development of world class clusters and networks are thus of growing importance".

Methodological Procedures

Sample

The sample consists of nine firms, all of related to the cloud computing vertical of Santa Catarina´s Association of Technology Companies (ACATE) in Brazil. Most of the interviewed firms operate with provide services Software as a Service (SaaS) and have a small size with a fairly low number of employees (under 20 employees in most of the firms).

For confidentiality reasons, the name of firms interviewed are not disclosed in this paper, thereby numbers are used to identify the firms (Firm 1, Firm 2, Firm 3 and so on). The name of the partners mentioned throughout the interviews will be revealed in the cases where the interviewed firms allowed their disclosure; in the other cases partners are identified by type and by a letter (for example, client company A).

Methods

The empirical study is based on two methods: Social Network Analysis and Content Analysis. The following paragraphs describe this approach in detail.

A network is composed of nodes (actors) and ties (relations). In this analysis, the nodes are the interviewed companies and their partner organizations in the innovation process. Therefore, we are analyzing inter-organizational networks. A tie exists when one of the interviewed firms establishes a partnership for innovation purposes.

The Social Network Analysis (SNA) is the use of a set of measures that allow characterizing the interaction patterns (network morphology) and its actors (properties of ties) (Sousa, 2008). According to Valk, Chaplin and Gijsbers (2011, p. 26) "literature in the area of social network analysis (SNA) gives insight into concepts of network structure that may influence for instance the extent of diffusion of knowledge through a network".

The choice of SNA is justified by the broad vision that it provides to the identification of the relations and partnerships between stakeholders of the innovation process, in this case, cloud computing providers and their partners: universities, suppliers, customers, research centers, etc. Furthermore, the SNA allows verifying patterns and observations about the cloud computing development in a Brazilian technological center, making possible to have an overview of the partnerships of the interviewed firms.

In order to (re)construct the networks, adjacency matrices were build, reflecting the innovation partnerships identified through interviews or secondary sources. Three different networks are (re)constructed and analyzed:

1. The overall network of all partnerships of all interviewed firms (Figure 1): provides an overview of the collaborative networks of the firms interviewed, reflecting strategic partnerships mentioned at interview (primary source) and the strategic partnerships identified though secondary sources (website of the interviewed firms; reports in the media; ACATE website; websites of research institutions and government agencies related to science, technology and innovation). 59 partnerships were identified and analyzed.

2. The network of strategic partnerships (Figure 2): using only the data collected through the interviews and reflecting the set of partnership considered strategic by the firms. 26 strategic partnerships were identified and analyzed.

3. Network of strategic partnerships that involved open innovation practices (Figure 3): built after a content analysis of the interviews, mapping only the strategic partnerships that actually involve Open Innovation practices. 9 strategic partnerships involving open innovation practices were identified and analyzed

The networks were then analyzed and graphed using UCINET and NetDraw softwares. In this study, the SNA was conducted at two steps:

1. Network diagrams using the Netdraw software. In these diagrams, the actors are represented by squares and the ties are represented by arrows. In these arrows the analyzed company (ego) is the source and the partner (mentioned in the interview or in a secondary source) is the target. The strength of each tie is represented by the thickness of the line. A tie is considered strong when the partnership is mentioned by both actors, thus involving reciprocity.

2. SNA measures and analysis to capture of the network configuration, namely its morphology and composition. The following properties were analyzed (Sousa, 2008; 2012):

a) Network Size – indicates the number of network elements. It was measured using the number of nodes and the number of ties.

b) Connectivity – a network is connected when it is possible to find a path between all pairs of nodes. A network that has several components is not connected. One component is a set of nodes without

links to the outside. When a network is composed of several components the ability of an actor to access network resources (including knowledge) is lower. In this paper we consider the number of components and the size of the largest component.

c) Density – captures the strength of the interconnection of the network. It is the ratio of the number of links present in the network and the total number of possible links. Much of the debate on the shape of the most favorable networks in the innovation process uses this indicator.

d) Strength of the ties - according to Granovetter (1982) the strength of ties can be analyzed through a combination of the amount of time, emotional intensity, intimacy and reciprocity that characterize the tie. As already mentioned, a tie is considered strong when it is reciprocal, that is, when both partners mention the partnership. The proportion of strong ties in total number of ties also gives an indication of the network cohesion.

e) Composition - the networks can be formed by various types of actor and we calculate the proportion of each type of in the total number of nodes. More specifically, we indicate the proportion of universities in each network.

f) Centrality – the analysis of centrality allows understanding the positioning of the different actors in the network. In this paper we considered two measures of centrality: i) degree centrality, which expresses the number of direct ties that an actor has with the other actors in the network, as a measure of activity; ii) betweeness centrality, which considers the number of times an actor lies between each pair of other organizations, enabling to assess whether an actor acts as broker facilitating the flow of information on the network. This measure captures situations in which actors have few contacts, but have a great importance in mediating the exchange and control of information circulating on the network.

Analysis of Partnership Networks

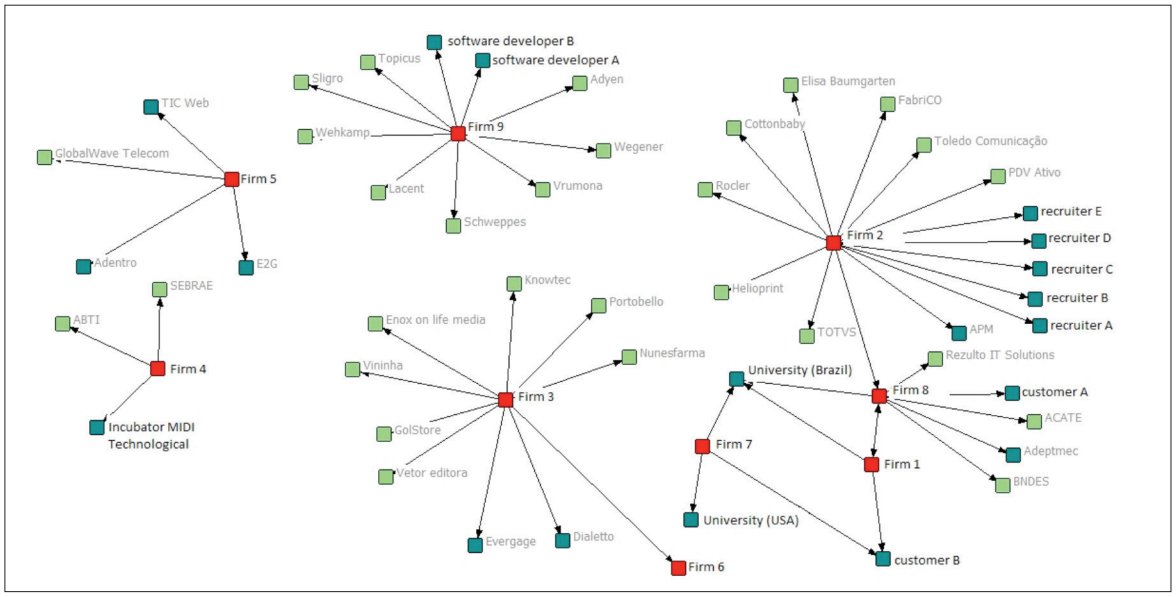
This section describes the results of the analysis of the firms' collaborative networks. As previously mentioned, here networks of different levels of specificity were considered to analysis: overall network of partnerships (broader includes all identified partnership), network of strategic partnerships (only includes partnerships classified as strategic) and network of Open Innovation practices (only includes the strategic partnerships which involve Open Innovation practices).

Overall Network of Partnerships

This network of partners involves 57 nodes (including the nine interviewed companies) and 55 ties (Figure 1). This relatively fragmented, especially if we take into account that all the interviewed companies belong to the same vertical of cloud computing). The network is made up of five distinct components, reflecting partnerships between interviewed companies or partner sharing between them is relatively rare. This fragmentation may hinder the diffusion of information and knowledge among the members of the association.

It is a network with a low density, since only 1.7% of the possible links are active (Table 1). This configuration is pointed out in the literature as being favorable for the generation of radical innovations, since it encompasses few redundant connections, promoting the access to novel ideas (McEvily & Zaheer, 1999). Nevertheless, it may be unfavorable to the development of trust, which is considered necessary for the exploration and implementation of these innovations (Ahuja, 2000; Gulati, 1998). This idea is reinforced by the fact that strong ties are also relatively infrequent. In fact, only two partnerships are seen as reciprocal, both involving Firm 8.

Figure 1. Global Network of Partnerships



Source: Research Data preparation of authors

Table 1. Information on the Global Network of Partnerships

Indicator	Value
Number of nodes	57
Number of ties	53
Number of components	5
Dimension of the largest component (nodes)	26
Density	1,7%
% Strong ties	3,8%
% Universities in all of nodes	3,5%

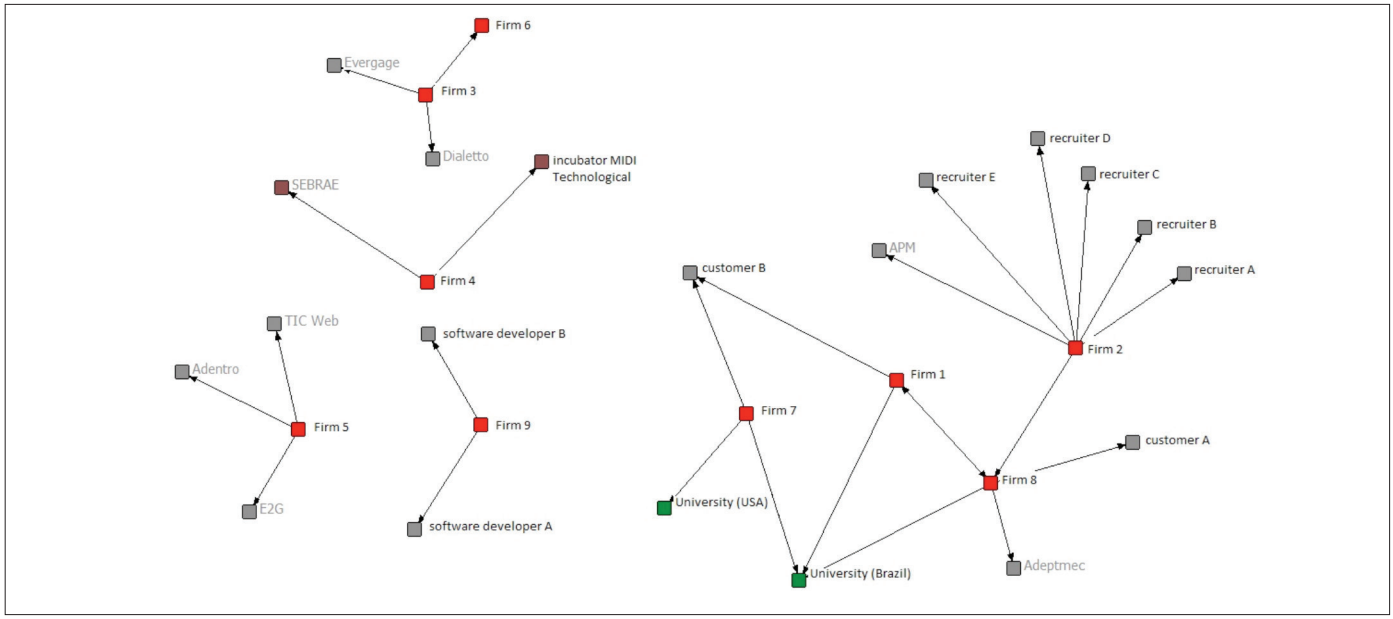
Source: Primary Data

Network of Strategic Partnerships

Strategic partnerships can be important strategies to be adopted in the context of disruptive innovations, such as cloud computing. Especially with the particularities and degree of novelty of the services using the infrastructure of this computational concept. In this way, the high investments and risks associated with emerging technologies reinforce the adoption of an open model in innovation management. In other words, given the complexity of the new computational model, the tendency to form strategic partnerships can be increasingly used. The complementarity of resources and knowledge among organizations involved in those partnerships, favors the success of innovation processes.

From the total 53 partnerships that were identified, the interviewed companies consider 26 as strategic. The network reflecting them is represented in Figure 2. This network, compared with the overall, exhibits a higher density, incidence of strong ties and presence of universities.

Figure 2. Network of Strategic Partnerships



Source: Primary Data

Table 2. Information on Network of Strategic Partnerships

Indicator	Value
Number of nodes	30
Number of ties	26
Number of components	5
Dimension of the largest component (nodes)	16
Density	3,0%
% Strong ties	7,7%
% Universities in all of nodes	6,7%

Source: Primary Data

Firm 2 has partnered with five human resources recruiting companies, a hardware supplier, complementing the offer of its product, and Firm 8, in a partnership seen as reciprocal where there was clearly a mutual exchange of market expertise.

In the case of Firm 4, the strategic partnerships are actually with support institutions, more specifically with an incubator and a support SME organization. These alliances are very relevant for the early stage in which the Firm is. The active participation of its managers in events and courses offered by these institutions promotes the environment of networking and the identification of new business opportunities.

Firm 5 mentioned, as strategic partners, two communication agencies, with which it develops a supplier-customer relation. The data storage infrastructure provider, ('Adentro'), despite being a relatively recent partnership (at the time of the interview) is also already considered strategic for the company. Therefore, this firm only establishes strategic partnerships with suppliers, and there are no interactions with other companies in the same segment or universities.

Firm 6 is only linked to Firm 3. This is an interesting situation, since firm 6 stated that it does not enter into partnerships and does not actively use networks of which it is a part. On the other hand, Firm 3 mentioned Firm 6, as one of its strategic partners. This situation makes evident the lack of understanding about the type of interaction between these firms. In the sense that Firm 6 considers the interaction with Firm 3 only a supplier-customer relationship, not considering it as a strategic partnership, therefore not having mentioned it in the interview and stating that it does not establishes Partnerships or adopts an Open Innovation management.

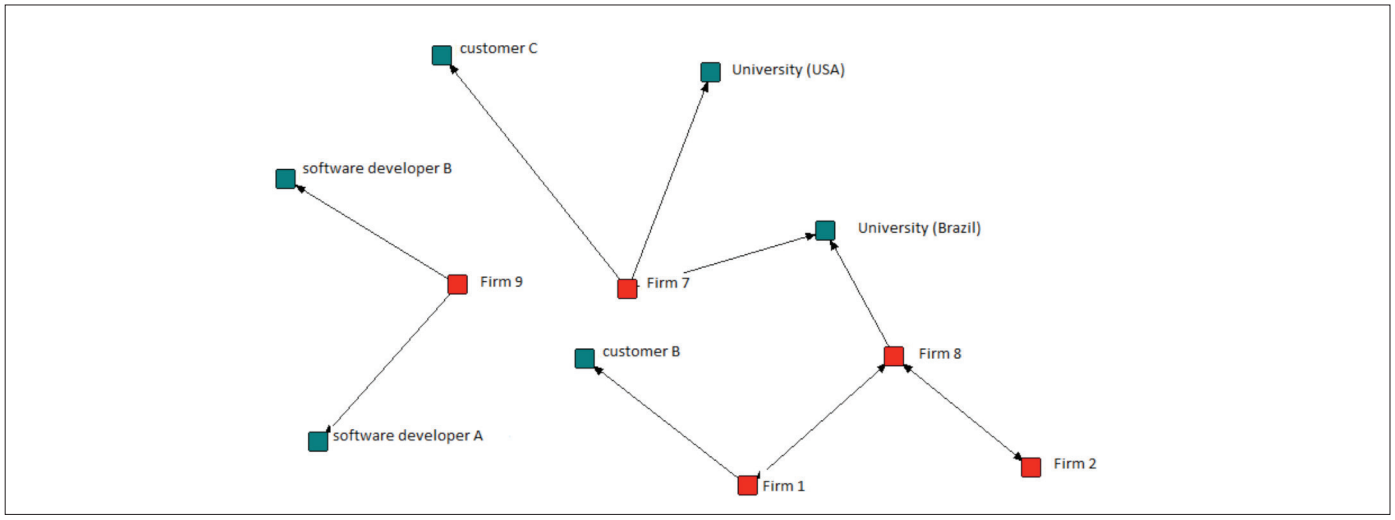
Firm 7 has established strategic partnerships with universities. Two cases are identified. The first is a Brazilian university, with whom a partnership was established and already finished. The dissolution was due to the fact that the outcomes did not match expectations. The firm acknowledges that there were failures in communication among that affected this outcome. The company then developed a new strategic partnership with a North American university within the scope of a particular project and with the clear goal of support its internationalization. Also, the visibility and prestige of the foreign partner were important motivating factors for the establishment of this relationship.

Firm 9 shows some particularities. The partnerships mentioned include software developers that are spin-offs of the company. Some self-employed professionals identified the opportunity and had a desire to start a new business, but could not begin it without support. Firm 9, recognizing the potential of the project, decided to participate in a joint venture and provided the infrastructure and support in the product development (expert knowledge).

Network of strategic partnerships that involved open innovation practices

From the 26 strategic partnerships mentioned during the interviews, only nine were identified as involving some practice characteristic of the open model. These practices were recognized thorough a content analysis of the interviews. Based on the theory of collaboration networks and on the Open Innovation literature, 11 practices were identified that correspond to the Open Innovation model among the strategic partnerships mentioned in the previous section.

Figure 3. Network of Strategic Partnerships involving Open Innovation Practices



Source: Research Data preparation of authors

The Open Innovation practices present in the strategic partnerships are:

- Customer involvement: Firms 1 and 7 appointed partnerships with their clients. Two cases of Open Innovation practices were identified, because it is assumed that these interactions are involving the client in the development of new products. In the case of the Firm 1, the main motivation to involve the customer in the innovation process was its profound knowledge of the market that made possible to develop a technological solution closer to the market perceived needs. Although trust was already established between the two organizations, it was resolved to establish a legal contract to secure the rights and responsibilities of both parties. The strategic partnership resulted in new products for Firm 1.

- Outsourcing of R&D: Two partnerships carried out by Firm 7 are considered open innovation practices in the scope of R&D activities, both examples of interactions with universities. Together with an American university, Firm 7 began to make adaptations in some products with potential sales in international markets. The company reached this academic partner through a program to support Brazilian startups. The opportunity to internationalize the innovation network was a motivating aspect for Firm 7 in defining the partnership. Before the establishment of the alliance, there were face-to-face meetings in the US and in Brazil as a way to experience the environments from each other. The alliance was formalized through contract, stipulating the rights and responsibilities of the organizations. The alliance is still recent and therefore it is difficult to measure the outcomes attained.

- Creation of new companies: Two practices of Open Innovation are identified that originated new companies with the support of Firm 9 and are considered strategic partnerships. The primary motivation of these partnerships was the opportunity recognized by professionals, who wanted to begin a new business. But they would not be able to develop their products without support, so they have searched for partners. Thus, Firm 9 did not promote the initiative of this alliance. The information about these new business opportunities reaches the company through an informal indication coming from employees, acquaintances or through networking. Afterwards, the company analyzes the potential of the project and when it considers it attractive, it designs the partnership, stipulating the tasks, the rights, and the responsibilities. A social contract is established to spread the company when business plans are at a more advanced level of development. It should be mentioned that Firm 9 does not invest on the new ventures, but rather provides infrastructure resources and expert knowledge. The two examples are still active partnerships, one beginning in 2009 and the other in 2011.

- Externalization of market competences: The cases of more substantial relationships occur between Firm 1 and Firm 8 and between Firm 2 and Firm 8, all participants in the cloud computing network of ACATE. The interaction between these organizations did not arise through ACATE, since the vertical of cloud computing did not yet exist. However, currently, the fact that they participate in this group is regarded as factor that strengthens the relation between them. The contacts between these companies were initiated by Firm 8, which uses a proactive partner identification strategy, in line with its growth strategy, in order to obtain the market knowledge needed to develop new products and, therefore, to increase the likelihood of successful in commercialization. At the same time, its partners (Firm 1 and Firm 2) actively participate in the product development process. It is therefore a practice of Open Innovation. The exploration of common markets was one of the main motivations, since both companies provide products and solutions for the same public. As such, some products have been integrated into each other's portfolio.

Conclusions

Collaborative partnerships can be essential strategies to be adopted in the context of complex innovations, as is the case of cloud computing. The high investments and risks associated with emerging technologies reinforce the idea defended by the adoption of the open model. In other words, in view of the complexity of the new computational model, the tendency to form partnerships and collaboration networks is of utmost significance. The complementarity of resources and knowledge among those involved favors the success of innovations. In this paper we tried to evaluate which collaborative practices are in fact practices characteristic of the Open Innovation model.

Brazil has some challenges in the infrastructure, which is an essential factor for the diffusion of cloud computing. Open Innovation, in this sense, can be a vital ally to reduce the effects of this lack of infrastructure, characteristic of emerging countries. Hence, companies can mitigate the deficiency of some competences through the interaction with other organizations.

However, when analyzing the indicators on the reality of innovation in Brazil, there is a low investment in R&D by Brazilian companies. And this low investment is not being counterweighed by the use of collaboration networks and practices of Open Innovation. The Brazilian innovation scenario is still marked by the low degree of use of Open Innovation strategies (PINTEC, 2011).

After analyzing the results of this study, as well as analyzing the results and obtaining the conclusions, a set of hypotheses has been formulated, that may lead further research: *Hypothesis 1* - The lack of systematization of the Innovation Management process can inhibit the adoption of the Open Innovation model, especially in the case of small and medium enterprises. *Hypothesis 2* - A collaboration network strongly marked by the presence of composite networks may promote the 'trustees' factor. *Hypothesis 3 - Companies tend to embrace the Open Innovation model in the development stage rather than the identification of ideas because the search for partners usually happens in a particular manner, to encounter an already identified need. Hypothesis 4 - The establishment of partnerships attenuates the uncertainty/risk associated with the adoption of Cloud Computing, favoring its diffusion.*

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ISSN: 0718-2724. (http://jotmi.org)

Online Consumer Trust: Trends in Research

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Abstract: This paper presents the literature review of studies published in 2004-2014 (Web 2.0 period) in the area of consumer online trust. Based on the content analysis of 138 papers, this study highlights three major research themes: (1) trust models, (2) technological, and (3) social factors impacting online trust. It also explores topics in each major theme found in direct studies of online consumer trust. Since this literature review uses the concept-centric approach, it points out not only the major trends in research but also three understudied areas: (1) green trust, (2) trust recovery, and (3) the role of ethics in developing online trust.

Keywords: online trust; research trends; literature review

Submitted: May 20th 2017 / Approved: July 3rd 2017

Introduction

The Internet has become an indispensable tool for international business as it does not recognize physical borders between countries and gives buyers access to online sellers from all continents. Being so far and yet so close, how does one know if a seller is genuine? With the ease of creating a commercial website and relatively affordable cost, the number of online stores has skyrocketed. Don Davis (2012), the editor of Internet Retailer magazine, estimated that 25 million online retailers sell products over the Internet. Each retailer tries to attract customers and entice them to complete a purchase. How does one know which online retailer (e-retailer) to trust and which e-retailer not to trust? The answer to this question is essential to academic researchers, businesses, and customers. Academic researchers create and extend knowledge of online trust; businesses apply that knowledge to practice to develop long-term relationships with customers, while customers become informed online shoppers.

Despite the extensive research in the area of e-commerce, the studies of online consumer behavior with emphasis on developing online trust are not that numerous and systematic. Chang, Cheung, and Lai (2005) in their literature review analyzed factors impacting the adoption of online shopping and noted that although trust has a significant impact on e-commerce, it has not been sufficiently studied and requires further investigation. Thus, the objective of this paper is to identify both common themes in online trust research conducted over a decade of the Web 2.0 environment (2004-2014) and gaps that could suggest directions for future exploration of this area. The purpose is not to offer a comprehensive review of the vast body of research but rather investigate what aspects of online trust need more exploration.

This paper is structured as follows: it starts with an overview of online trust that creates a foundation for and leads to the presentation of main trends in online trust research; then follows the explanation of how the search of publications for the literature review was conducted. After that, we present the result of the search along with the different types of article classification. Next section discusses results while Section 6 describes the contribution and practical implications. Finally, Section 7 concludes the literature review by listing limitations and offering suggestions for future research.

1. Defining Online Trust

Before discussing the literature on online trust, it is necessary to define the phenomenon itself and investigate how online trust differs from traditional trust. While numerous interpretations of the concept of trust exist (Fukuyama, 1995; Mayer et al., 1995; Mollering, 2006; Pettit, 1995), they all focus on the following elements that have to be present for trust to occur (Bachmann, 2010; Barber, 1983; Cook et al., 2009; Dietz, 2011; Grabner-Kraeuter & Kaluscha, 2008; Rousseau et al., 1998):

- Two actors - trustor and trustee - must exist to develop trust
- Vulnerability must be present (trust exists only in a risky or uncertain situation)
- Trust is a context-sensitive concept (trust is affected by many subjective individual and environmental circumstances, and as such, is dependent on the context of the situation)

While shopping online, a consumer, as a trustor, finds himself/herself in a risky situation where he/she uses the Internet as a tool to communicate his/her needs to an e-vendor and submits private information about himself/herself. He or she chooses a method of payment and expects the website to be a reliable means for the transaction and the vendor to behave in an honest and professional manner when fulfilling the purchase request.

A definition of online trust was formed as "an attitude of confident expectation in an online situation of risk that one's vulnerabilities will not be exploited" (Beldad, de Jong, & Steehouder, 2010, p.860) and reflects consensus among online trust researchers that the nature of,

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ISSN: 0718-2724. (http://jotmi.org)

and basic meaning of, online trust is not fundamentally different from the concept of face-to-face trust (Shankar, Urban, & Sultan, 2002; Jarvenpaa & Rao, 2003; Corritore, Kracher, &Wiedenbeck, 2003; Wang & Emurian, 2005), notwithstanding that a human being has to trust an object created by a human being rather than another human being (Corritore et al., 2003).

Online trust has been identified as a critical component of a business strategy as it reduces perceived risk and creates positive word-of-mouth which, consequently, impacts a customer's decision to buy (Chen & Barnes, 2007; Fan, Ming, & Whinston, 2005; Fang, Chiu, & Wang, 2011; Hassanein & Head, 2007). Consumer trust and satisfaction with the transaction form the foundation for the long-term commercial relationship between a company and a customer (Kim, Ferrin, & Rao, 2009; Morgan & Hunt, 1994).

2. Literature Search

With the growing popularity of e-commerce, the number of academic studies in that area increased significantly covering various aspects of online retailing. The scope of research widens from technical issues of the business platforms to long-term customer relationships. However, publications aimed at the review of the previously conducted research are rare and rudimentary. Wareham, Zheng, and Straub (2005) offered a discussion of the critical themes in e-commerce focusing on publications in the IS (Information Systems) journals during the timeframe of 1997 – 2003. Wang and Chen (2010) reviewed studies published in the first decade of online commercial activities (1999-2008) and noted that the focus of research in electronic commerce shifted from technology orientation to management.

As the technology matured, the focus of studies has naturally moved to managing electronic commerce activities that could attract and retain consumers. At the same time, marketing efforts have more and more been aimed at establishing customer relationships based on trust and commitment (Morgan & Hunt, 1994). While this shift in research is acknowledged, there seems to be a lack of observations and understanding of trends in trust research in the online commercial environment. The latter is what this paper will provide.

The period for this literature review was selected as 2004-2014 because 2004 is noted to be a pivotal year for the Internet commercial development. During that year, the term 'Web 2.0' was introduced to e-commerce to describe Internet technological abilities that drastically changed the business model. O'Reilly (2007) summarized the breakthrough in technology that allowed building computer applications directly on the Web rather than on desktops. This achievement resulted in the consumers' ability to create content in the form of text, pictures, or videos that would deliver value to other people and businesses. On the one hand, it became relatively easy for individuals to open an online store, but on the other hand, it made individuals more powerful regarding creating or ruining a company's reputation by posting reviews online. Web 2.0 developments lead to fundamental changes in business models based on social networking, interaction orientation, personalization/customization, and user added value (Wirtz, Schilke, & Ullrich, 2010). The year 2004 was noted by Clarke and Pucihar (2013) as the beginning of the social network services era in the digital economy.

The period of 2004-2014 is also important in research of online trust as it marks the end of the Web 2.0 period and the beginning of the Web 3.0 (Nations, 2016). Although the term Web 3.0 was coined by John Markoff (2006) in 2006, the transition to the Semantic Web did not happen then as it took time to combine artificial intelligence and mobile Internet devices. Thus, this literature review covers the decade of online trust research in the Web 2.0 environment as it looks into the issue of trust between customers and e-vendors. The process of selecting articles for this review followed recommendations expressed by Okoli and Schabram (2010) and Rousseau, Manning, and Denyer (2008).

The literature search was performed within two databases: the Web of Science and EBSCO Host. According to Thomson Reuters (Site 1), the Web of Science (formerly Web of Knowledge) database was the first online citation resource. It currently has 30 years of bibliometric experience, maintains over 90 million records with over one billion cited references. The Web of Science provides access to 3,000 journals in over 55 social science disciplines and 250 scientific journals, thus meeting the goal of this paper. IEEE Xplore Digital Library of the Institute of Electrical and Electronics Engineers (Site 2) maintains the database of over 100 peer-reviewed journals, lists almost 2 million full-time documents and 4 million records. Another popular database - ACM - the Association for Computing Machinery - digital library (Site 3) provides 407,367 full-text articles which cover the fields of computing and information technology. Since online trust is studied by marketing, management, psychology, and other social sciences along with computer science and information technology, the Web of Science database was selected as the most appropriate for the purpose of this study.

The search was performed using the following two key phrases: "online trust" and "e-commerce" in the "Topic" category of records from 2004 to 2014 inclusively. These phrases have been carefully selected to avoid the problem of using trust related specific terms or "buzzwords" that "appear and disappear from literature" (Levy & Ellis, 2006, p. 190). The "Topic" rather than "Text" category was selected to narrow down the search results only to the articles focusing on studying trust directly rather than other aspects of e-commerce that might only indirectly involve online consumer trust. The other selection criterion was that papers should be full papers publications in peer-reviewed English language journals. With this search approach, the Web of Science database returned 123 results.

The second database used for this study is EBSCOHost, a fee-based online research service with 375 full-text databases and a collection of 380,000-plus e-books (Brynko, 2013). The search based on the same combination of "online trust" AND "e-commerce" returned 28 results. Papers found in EBSCO were combined with the papers found through the Web of Science. As there were 14 duplicate articles – those found in both databases, the total number of papers under review was 138.

Initially, a "practical screen" (Okoli & Schabram, 2010, p.7) was conducted to determine which studies should be selected. At that time abstracts of the papers were reviewed to ensure that articles indeed cover the subject of online trust. The data about publications were entered in an Excel worksheet which made filtering of records easier. In the second round of review, each full article was read, and the content coding and classification of the articles were completed. Based on the named selection criteria, some publications were excluded from the review:

- Among the search results, there was one book and individual chapters in three books discussing online trust in e-commerce or m-commerce. Since the focus of this review is on the article publications in academic journals, these four publications were not considered in our subsequent analysis.
- One result was a publication in Spanish, although its abstract was in English. Since the full paper was not available in English, it was not included in further analyses.
- Conference papers or conference abstracts rather than full papers published in the conference proceedings were not considered. Clarke and Pucihar (2013) have already reviewed 1,000 conference papers submitted to the Bled eConference in 25 years (1988-2013) and there was no need to duplicate the previous study. Fifty-five conference presentations were dropped from our list.
- Articles studying trust in non-commercial websites (non-profit and government organizations) were rejected for further analyses as not meeting our selection criteria.
- Articles researching auctions or consumer-to-consumer transactions were not taken further as consumer bidding behavior is different from the consumer buying behavior in a traditional retail environment.
- Doctoral dissertations, master's theses, and unpublished working papers were excluded from our analyses.

As a result, fifty-four full papers out of 138 publications in the area of online trust have been included for the analysis of trends in online trust research. Although this search is not exhaustive, it captures a sufficient number of publications in this field.

3. Classifications of Publications

First, all fifty-four publications were classified based on the type of the article: literature review, theoretical paper, or empirical research. For the purpose of this paper, literature review articles were identified as those presenting work of others over a specified period or covering a specific topic. Such articles "summarize existence evidence, identify gaps in research and provide a framework for positioning research endeavors" (Okoli & Schabram, 2010, p. 3). Theoretical papers were defined as papers presenting a theoretical analysis based on ideas not supported by empirical evidence. Empirical research papers were classified as such if they reported results of the primary research. Table 1 below shows the results of this grouping.

Table 1. Classification of publications based on the type of the article.

Type of the article	Number of publications	Percent of the total
Literature review	5	9.25%
Theoretical paper	6	11.11%
Empirical research	43	79.63%
Total	54	100.00%

Four out of five studies classified as literature reviews were topic-specific surveys of literature where the author(s) selected an aspect of online trust research, and then found, and analyzed academic studies exploring that topic. For example, the topic of web design was investigated by Cyr (2014) and Karimov, Brengman, and van Hove (2011), adoption of e-commerce Chang et al. (2005), and antecedents of online trust were reviewed by Beldad, de Jong, and Steehouder (2010). One study (Urban, Amyx, & Lorenson, 2009) reported the state of research in the area of online trust from a holistic perspective and showed different aspects of online trust research – a process of developing online trust, online privacy and security, website design, and heterogeneity of trust.

As the literature review studies on web design show, there is empirical evidence that a website has cues which impact developing consumer online trust, satisfaction, and loyalty but there is no consensus among the researchers on exactly what online features signal trustworthiness to online shoppers (Cyr, 2014). Thus, Cyr (2014) suggested three categories of website key elements – navigation, information, and visual, while Karimov et al. (2011) discussed visual design (graphics and structure), social cue design (social media, online help and human-like features), and content design (product and company information, and assurance of transactions). Both reviews on the website design noted the abundance of factors influencing consumer perceptions of online trustworthiness.

Chang et al. (2005) reviewed 45 papers that they found relevant to their study and identified three main categories of research on what impacts e-commerce acceptance – perceived ability of a website to complete a transaction, characteristics of a customer, and perceived characteristics of a product. Meanwhile, Beldad et al. (2010) reviewed literature related to studying antecedents of online trust based on three groups: consumer-based, website-based, and company-based determinants of trust. These two studies support each other as areas of research identified by Chang et al. (2005) correspond to categories of determinants of trust introduced by Beldad et al. (2010).

Six theoretical papers covered three major areas: the concept of online trust, legal, and technological factors impacting online trust. Theoretical foundations of online trust were presented by papers published by Riegelsberger, Sasse, and McCarthy (2005) and Wang and Emurian (2005). O'Hara (2005) discussed how contract statutes and court doctrines could be modified in order to enhance consumer trust while M. R. Muhammad and M. Muhammad (2013) reviewed Shari'ah laws and how online trust model fits those. The impact of cooperative review mechanisms and the adverse effect of trust certifications were

conceptualized respectively by Fan et al. (2005) and Edelman (2011). The overall ambition of the theoretical papers was to offer different pieces to a big overall picture of the online trust concept.

The forty-three articles reporting results of empirical studies were analyzed with the purpose of identifying the major trends in online trust research. Figure 1 illustrates these trends. An interesting observation is that all of those studies are conducted with quantitative research methods. A few researchers used focus groups to discuss the items on the survey before collecting the data, but no qualitative studies in the area of online trust research in the commercial environment were found in the articles selected for the review. The following section presents the subject areas of these forty-three studies.

4. Main Areas of Online Trust Research

Following the established process for conducting a literature review, data extraction had to be completed before the analysis and synthesis of studies could begin (Okoli & Schabram, 2010). The review of the content of forty-three empirical studies was performed to determine both clusters and outliers of research areas by common data extraction procedures (Rousseau et al., 2008). As the purpose of the literature review was to establish research trends in the area of online trust in the commercial environment, information about the main study area was extracted from each article. Thus, the review process was completed in several steps: (1) reviewing citations and abstracts followed by (2) the review of the full text of articles to complete a "thematic analysis" of areas of study (Tranfield, Denyer, & Smart, 2003, p. 218). During the third step, the content of each paper was coded with a keyword that reflected the main research area and later analyzed (step four). This method has been defined as an interpretive approach which was validated by researchers previously (Rousseau et al., 2008; Tranfield et al., 2003).

Following Tranfield et al. (2003), a data extraction form was used in preparation for the content analysis. The form was an Excel worksheet which contained details of the information source (authors, title, publication, year of publication) and the context of the study. After the review of the full text of each article, all articles were coded based on the main study area and the research method. The use of the Excel worksheet allowed for easier filtering of data based on selected criteria – author, title, publication, year of publication, main study area, research method, and a study sample size. The form served as evidence of papers which went through the review, a visual representation of the link between the articles and the aim of the literature review, and data storage (Tranfield et al., 2003).

The "bottom-up" approach was used during the coding process when papers were divided into groups according to research topics covered in studies. This process of grouping is a commonly used and validated approach in qualitative data analysis consisting of identifying concept categories incrementally during the coding process rather than using a predetermined list of concepts (Carley, 1993; Gray & Densten, 1998). This method helps to discover new trends rather than trying to fit current research into the list of existing categories.

Once the agreement between two researchers had been achieved, the review of codes resulted in the following grouping: three major research categories and twelve subcategories. Three main categories of topics were identified as trust models, technological factors, and social factors impacting online consumer trust. Within each category, specific sub-categories were grouped. The graph in Figure 1 follows the approach which was originally undertaken by Ngai and Wat (2002) to present the topic classification.

The three research categories shown in Figure 1 are suggested based on the following theoretical concepts:

(1) A trust model offers a holistic (overall) picture of online trust development showing antecedents of online trust under a specific context. Since online trust is highly contextualized, these models provide a theoretical foundation to better understand the online trust phenomenon

(2) Technological factors reflect a cognitive approach to trust as they show a company's ability to complete a transaction in a secure environment which is rationally evaluated by consumers. These factors also correspond to the concept of institutional trust where an individual treats an institutional structure and institutional arrangements as ways to reduce risk in a particular situation (Bachmann & Inkpen, 2011).

(3) Social factors correspond to the affective approach to trust as these factors describe consumer's perceptions and emotions about perceived trustworthiness of a website.

Figure1. Main categories of online trust research

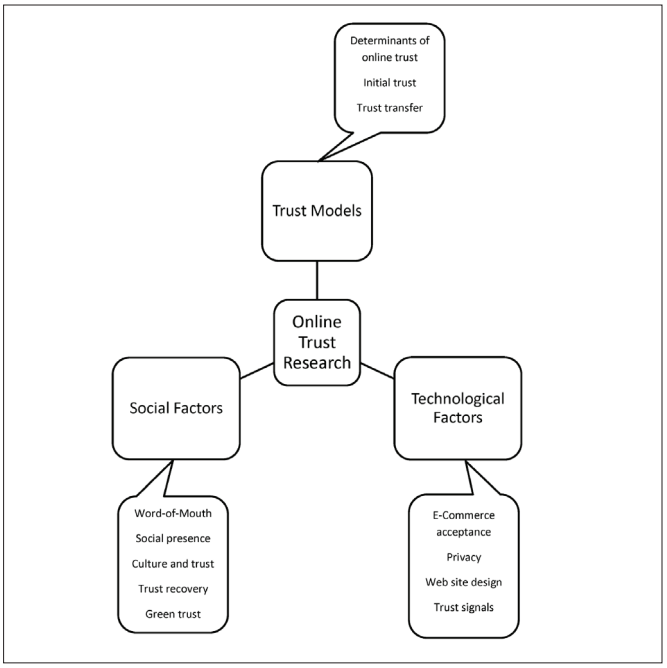

Table 2 shows the frequency of article distribution by subject subcategories of research. Each key category is looked into in greater depth below.

Table 2. Distribution of articles by the topic of research.

Topics of research	Number of articles	% of total
Determinants of trust	14	32.56%
Website design	5	11.63%
Trust signals	5	11.63%
Initial trust	4	9.30%
E-commerce acceptance	3	6.97%
Trust transfer	3	6.97%
Privacy	2	4.65%
Social presence	2	4.65%
Word –of-mouth	2	4.65%
Culture and trust	1	2.32%
Green trust	1	2.32%
Trust recovery	1	2.32%
Total	43	100.00%*

***Note:** Due to rounding, the actual total is 99.97%.

4.1. Trust Models

The largest group of articles on online trust in e-commerce (48.84%) belongs to the category of trust models. This finding was not surprising as the phenomenon of online trust is relatively new and "requires a strong theoretical basis" (Benbasat, Gefen, & Pavlou, p. 6). Papers found in this category focus on online trust as a process and look at what causes trust to occur, develop, and/or transfer from one environment to another.

- *Determinants of online trust* are factors that lead to developing online trust. Studies in this category focus on a variety of antecedents ranging from consumer personal characteristics and website features (Chang & Fang, 2013), system structural assurance (Chau, Hu, Lee, & Au, 2007) to country specific consumer cultural characteristics (Casaló, Flavián, & Guinalíu, 2011; Eid, 2011).

- *Initial trust* as the first stage in online trust development was the focus of four papers under this review (Chen & Barnes, 2007; Li, Jiang & Wu, 2014; G. Wu, Hu, and Y. Wu, 2010; Yaobin & Tao, 2007).

- *Trust transfer* as a concept of applying trust in a vendor in one domain (traditional, brick store) to another (online domain) was explored by Bock, Lee, Kuan, and Kim (2012), Kuan and Bock (2007), and Lee, Kang, and McKnight (2007).

4.2. Technological Factors

Articles included in the technological factors category investigated e-commerce adoption, privacy issues, website design, and trust signals.

- *E-Commerce acceptance*: In two articles found on this topic, acceptance of online shopping is viewed from the consumers' perspective rather than from the companies' side. The scope varied from e-commerce adoption by older generations of buyers (Chattaraman, Kwon, & Gilbert, 2012) to a single country case of Tanzania (Makame, Kang, & Park, 2014). The third paper (Roy & Ghose, 2006) discussed the process of e-commerce adoption as a two-phase action: first Internet non-users are converted into Internet users, and then from the Internet users they transition to e-commerce buyers.

- *Privacy issues*: Despite the advances in technology and standardization of e-commerce business platforms, the issue of privacy remains one of the key research areas of online trust studies. The concept of privacy on the Internet is defined as people's ability "to control the terms under which their personal information is acquired and used" (Culnan, 200, p. 20). Personal information includes both private and public data. Companies that can collect consumer data to analyze customers' needs and spending habits have a strategic advantage in a competitive marketplace (Wheelen, Hunger, Hoffman, & Bamford, 2015). Due to the technological developments that make collecting customer information online an easy task for marketers, the public portion of the personal information has been increasing (Caudill & Murphy, 2000). Privacy concerns relate to data collection techniques as well as data storage, processing and handling (O'Brien &Torres, 2012; Peštek, Resić, & Nožica, 2004). To protect their privacy, consumers expect to have a certain degree of control over their information submitted online and have online tools that help to exercise that control.

- *Website design*: According to one of the basic principles of the trust-building process, a trustor's experience with the object of trust determines how much trust toward that object will be established (Blau, 1974; Luhmann, 1979). Since the object of online trust is a website, customers develop trust in a company according to their experience of dealing with the company's website. If consumers' perception of the website is that of a company capable of delivering promised value, then consumers are more likely to develop trust (Bart, Shankar, Sultan, &Urban, 2005). This subcategory was in the top three most frequently studied topics in the articles selected for our analysis.

- *Trust signals* or trust marks are website elements which are "presented in an effort to dispel consumers' concerns about Internet security and privacy and, therefore, to increase firm-specific trust levels" (Aiken & Boush, 2006, p. 310). Among trust signals studied by researchers are seals of approval from trusted third party (certification systems that promote trust online), photos of sales persons, and consumer rating system. A different approach was taken by San Martín and Jiménez (2011) who studied the role of gender in interpreting online trust signals in Spanish customers.

4.3. Social Factors

The third category, identified as social factors, contains studies of the socio-cultural factors impacting online trust development: word-of-mouth, social presence, culture, trust recovery, and green trust.

- *Word-of-mouth:* The role of communication between customers about a company's ability, benevolence, and integrity, as well as its product is in the center of studies in this sub-category (Awad & Ragowsky, 2008; Lee, Park, & Han, 2011).

- *Social Presence:* As online shopping is viewed as impersonal, automated, and lacking human touch (Beldad et al., 2010), researchers continue to explore the impact of the virtual environment on the customers' perceptions of "human warmth and sociability" (Hassainen & Head, 2007, p. 690). Web elements that create those perceptions – pictures of people, social networks, blogs – are the main objects of study in this sub-category.

- *Culture:* Despite the different nuances in numerous definitions of culture there is consensus among researchers that culture is shared among people, is taught from generation to generation, and affects people's view of the world, thinking, and behavior (G. Hofstede, G.J. Hofstede, & Minkov, 2010; Hall, 1976; Trompenaars, 1994). Culture expresses shared values that are reflected in symbols, myths, and languages (Smircich, 1983). As trust is a social phenomenon, researchers investigate how cultural backgrounds of online shoppers might impact online trust development as the culture of shoppers might not be the same as the cultural background of the retailers (Bente et al., 2014; Casaló et al., 2011). When people from two identical cultures interact, the trust building process should be "relatively straightforward" (Saunders, Skinner, & Lewicki, 2010, p. 19). However, when people from different cultures interact, they use their value systems to analyze cues or trust symbols displayed by others. As a result, there might be misunderstanding and misinterpretation of intentions (Dietz, Gillespie, & Chao, 2010) which could lead to abandoning the website.

- *Trust recovery:* In situations when unsatisfied consumers complain about their online shopping experiences, e-retailers handle those complaints differently. Failure to address customers' complaints lead to reduced trust while satisfactory approaches to solving customers' complaints can enhance trust (Pizzutti & Fernandes, 2010).

- *Green trust:* A new research area was found among social factors – the "green" consumer movement. Chen and Chang (2013) offered a new managerial framework that combines the phenomenon of green marketing and relationship marketing into green trust. Green trust was defined as "a willingness to depend on a product, service, or brand based on the belief or expectation resulting from its credibility, benevolence, and ability about its environmental performance" (Chen & Chang, 2013, p.72).

5. Discussion

The purpose of this literature review was to identify the main trends in academic research of online trust in e-commerce during the 2004-2014 period and not to evaluate or judge the state of this research. Although 138 publications were selected that met the initial inclusion criteria, only 54 papers were included in this review. These studies showed a fair diversity of topics, but the results of the content analysis revealed the concentration of studies in three main areas: trust models, technological and social factors impacting online trust.

The scope of trust models extends from studying antecedents or determinants of online trust (Gregori et al., 2014; Hwang, 2009; Peštek, Resić, & Nožica, 2011) to researching the impact of online trust on the consumer buying behavior (Chau et al., 2007; Chiu et al., 2009), from investigating specifics of initial online trust (Chen & Barnes, 2007; Wu, Hu, &Wu, 2010) to studying a possibility of transfer of traditional trust in "brick" retailers to "click" retailers (Bock et al., 2012; Kuan & Bock, 2007) to comparing antecedents of trust and distrust as two coexisting constructs (Chang & Fang, 2013). The fact that this topic is the top research area shows the on-going interest to studying factors impacting online trust and continuous attempts to create a framework for online trust (Beldad et al., 2010).

Due to the higher number of uncertain aspects in e-commerce, development of trust is significantly more important, but also more difficult, in the online environment than in a face-to-face situation. Online buyers are separated from online retailers in time and place (Pavlou, Liang, & Xue, 2007; Riegelsberger et al., 2005), and shoppers can not touch, smell, taste or try on tangible products (Chen & Dibb, 2010). Due to these specifics of online exchanges, there is a higher level of opportunism: an online vendor can take the payment but either delivers a wrong product or does not deliver at all; there is a possibility of a retailer to delay a product delivery or not to exchange a faulty product (Peštek, Resić, & Nožica, 2011). Negative consequences of online transactions that might go wrong are greater than the possible positive outcome (Lee & Turban, 2001). Hence the trend in the online trust studies is to explore antecedents of online trust, initial trust, and trust development. If a consumer does not develop initial trust in an e-retailer from the initial visit, then there is a little chance of a consumer returning to that website (Wang, Guo, Niu, & Li, 2011).

When observing the dominant trends in online trust research, two approaches stand out – studying online trust from a technological perspective or the social one. The technological perspective reviews online tools and the Web capabilities to complete a transaction. The social approach focuses on the impact of the online community and personal attributes of an online buyer. It appears, however, that studies combine both: it is difficult to consider online word-of-mouth, for example, as an online trust antecedent if an e-vendor does not offer a blog or a review system for customers. If a website does not have this feature, does it mean that customers do not develop online trust toward that vendor? Or, on the other hand, if technologically, a website is designed with the use of all the latest interactive tools – 3D images, online chat with a customer service representative, high

customization of a website, and other tools – does it help a customer develop online trust without considering that customer's social environment and personal characteristics?

As Table 2 shows, the top four research areas are determinants of trust, website design, trust signals, and initial trust. The least explored two topics are green trust and trust recovery, as only one article was found in each of those sub-categories. The only article in the area of green trust found for this literature review suggests that companies which embraced environmental protection as a part of their social responsibility and business strategy should integrate concepts of green marketing into all marketing activities (Chen & Chang, 2013). Green marketing refers to all activities that generate and facilitate exchanges to satisfy consumers' needs with minimal impact on the natural environment (Polonsky, 1994). It is argued that companies need to reveal more information about their product and its impact on the natural environment to allow customers compare green products to traditional ones. This comparison helps to reduce perceived risks and concerns about the quality of a green product. Chen and Chang (2013) introduced the new constructs of "green perceived quality" and "green perceived risk" and empirically tested the relationships between green perceived quality, green perceived risk, green satisfaction, and green trust.

Process of trust repair after a company's failure to deliver a product was studied previously both in the situation of a traditional, face-to-face environment (Dietz & Gillespie 2012) and in online situations, especially with regard to government websites (Beldad et al., 2012; Schaupp, Carter, & McBride, 2010). However, research of online trust recovery in the context of e-commerce seems to be understudied. A quick search in the Google Scholar using the key phrase "online trust recovery" did not return any results, a follow-up search with the phrase "online trust repair" did not show any articles within that database.

6. Contribution and Practical Implications

The most important contribution of this review is that it identifies trends in trust research in the area of e-commerce in the Web 2.0 environment in 2004-2014. Analyzing those trends helps to identify understudied areas and suggest some future areas for online trust research in Web 3.0.

As our literature review shows, one of the new areas of studies deals with green trust. Although this type of trust seems to reflect consumers' trust in particular characteristics of some products rather than overall online trust, an interesting study could be to investigate if indeed green trust could be treated as a different type of trust in a specific context. It would emphasize trust toward green marketing in both traditional and online environment, thus adding to existing trust classifications.

The area of trust recovery in the commercial online environment could and should be explored in more details. Establishing long-term customer relationships based on trust and commitment is a successful business strategy (Morgan & Hunt, 1994). Unfortunately, not all e-vendors implement this strategy flawlessly, and issues of failing to deliver as promised and online fraud are still abound. For example, the fraud rate in online transactions in China alone was noted to be between 9% and 47% during seven months (October 17, 2008, and May 17, 2009) (Zhang et al., 2013).

This literature review also shows that there is another area that is not studied in depth as it was missing in the topics presented in Table 2. Since an e-vendor presents a product virtually, it is easy for a company to exaggerate that product's value and qualities. An area that seems to be understudied is online ethics and trust. Cheng, Yang, Chen, and Wu (2011) defined ethics in e-commerce (EC) as "as a consumer's perception about the practice of the EC website in its handling of consumers in a confidential, fair, honest and sincere manner in the transaction process"(p. 4503). Overall, the studies of ethics in e-commerce identified the top ethical issues as fraud, intellectual property, privacy and informed consent, protection of children, security of information, product warranty, plagiarism, and trust (Cheng et al., 2011; Roman, 2007; Kracher & Corritore, 2004). However, not a single article on ethics and trust was found among the studies selected for this literature review. Hence, there is a lack of studies investigating a direct impact of e-vendors' ethical conduct on online consumer trust, which constitutes a research gap in online trust research.

These three areas (green trust, trust recovery, and the role of ethics in developing online trust) rate high on the online trust research agenda. Studying these in detail will help not only to extend our knowledge of various dimensions of online trust but contribute to practical solutions in some key problems in online trust development.

7. Limitations and Future Research

This literature review has its limitations:

First, it is not exhaustive because the number of online trust studies in the commercial environment meeting the strict criteria of our selection process was not very numerous in the databases used for this review. A similar search in Google Scholar (a combination of "online trust" AND "e-commerce" for the 2004-2014 period run on November 3, 2014, for example, returned the total number of 4,340 articles while EBSCO showed 29 articles when searched with these keywords. This variation in number (from 29 to 4,340) of papers available online could be explained by the differences in algorithm approaches used by the databases and search engines in finding articles that match key phrases. It should be noted that some papers were omitted unintentionally as the results of the Web of Science served as the foundation for this review. Any literature review is biased when it comes to the selection criteria used to identify papers for a review. Narrowing our choice of literature offers a better focus on the topic of discussion but makes generalization difficult.

Second, there was a significant challenge to clearly and distinctly identify the major area of research and some of the articles could have been grouped in several categories.

Despite these limitations, this paper is the first systematic attempt to offer a review of research trends in the area of online consumer trust. It presents initial findings that lead to identifying areas for future research. This literature review covered studies evolving around the Web 2.0. The term "Web 2.0" (read-write) refers to the second generation of the Internet that takes advantage of the network nature of the Web where participants can contribute to the online content. Unlike Web 1.0 (the Web of documents) where Web administrators published files for public to read online (Hiremath & Kenchakkanavar, 2016), Web 2.0 (the Web of people) is a set of applications that help to create, validate, manage, share and consume information (Aghaei, Nematbakhsh, & Farsani, 2012). The extension of the Web 2.0 is Web 3.0 (Antunes, Freire, & Costa, 2016), which is referred to as the semantic web or the web of data. The purpose of the semantic web is to allow seamless integration of different sources in various formats into one application. It means that the vast volume of data is read and processed by the system rather than people. It also changes the focus from "human in the loop to humanity in the loop" (Hendler & Berners-Lee, 2010, p. 160). Trust as a social concept is a major part of this humanity in the loop as noted by both researchers and practitioners (Artz & Gill, 2007; Hendler & Berners-Lee, 2010).

It would be of interest to review online trust research trends in the era of the Web 3.0 to see if the main trends remain the same or change, and if they change – what direction and why. Since the technological progress has not stopped and some researchers have already introduced Web 4.0 as "symbiotic Web" (Aghaei et al., 2012, p. 8), this type of review could provide an academic foundation for trust research of Web 4.0.

Another area of future research could and should be mobile and social commerce as new subcategories of e-commerce. Recent technological advancements led to the development of mobile electronic devices (such as smartphones and tablets). Online shoppers started using these devices for purchases thus creating a new phenomenon of mobile commerce. Mobile commerce or m-commerce is defined as a subset of e-commerce (Ngai & Gunasekaran, 2007) which uses wireless, radio-type signals to conduct business transactions on the Web (Siau & Shen, 2003; Yeh & Li, 2009).

The popularity of social networks and users' increased involvement in social media have changed online consumer purchasing behavior and led to a new type of the business model known as social commerce or s-commerce (Liang & Turban, 2012). This new type of e-commerce combines social networking and shopping into one experience (Hsiao et al., 2010). Social commerce or s-commerce was defined as 'a new business model of e-commerce driven by social media (e.g., SNSs) that facilitates the purchasing and selling of various products and services' (Kim & Park, 2013, p. 319). Since by definition, social commerce is based on the product reviews created by customers, trust is more important here than in e-commerce due to a higher level of interactivity where trust in participants of a social network becomes crucial (Kim & Park, 2013). Once consumers trust product recommendations, they are more likely to buy that product (Hsiao et al., 2010).

Conclusion

Online trust has been a focus of research in various academic disciplines. This paper reviews only studies on consumer online trust in e-commerce conducted and published in 2004-2014. This period was selected as it marks the start and the tenth anniversary of the Web 2.0 technological developments that made the Internet truly interactive (O'Reilly, 2007). One hundred and thirty-eight articles were reviewed in preparation of this paper. Fifty-four papers were selected for analysis: five of them reviewed literature, six contributed to the theory development, and forty-three articles reported empirical research in the area of online trust in the commercial environment. An interpretive approach to research synthesis was used when the content of papers selected for the literature review was analyzed, the emerging themes coded and described (Rousseau et al., 2008; Tranfield et al., 2003). As the result of the analysis, this paper highlights three major research themes (trust models, technological and social factors impacting online trust) and explores topics in each major theme found in direct studies of online consumer trust.

This paper enhances the scientific community's understanding of the existing body of knowledge about online trust. As it is based on the concept-centric approach (Levy & Ellis, 2006; Webster & Watson, 2002), it points out not only the major trends in research but also some understudied areas that might help other researchers to expand our knowledge of online trust.

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