The determinant factors of innovation related with Customer Knowledge Management

Los factores determinantes de las innovaciones relacionadas con la Administración del Conocimiento del Consumidor

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ABSTRACT

Innovation can be broken down in stages (INNOVS) to increase the Competitive Advantage. When the Innovation improves the Knowledge Management in the firms based on the sense of information: for, from and about the customers, is called: Customer Knowledge Management (CKM). The aim of this study is to solve: ¿Which are the determinant factors between INNOVS with CKM? A questionnaire was applied on 200 SME´s from the software developer sector in Guadalajara (SDSG), México involving Multiple Regression Analysis by Stepwise method. The results pointed out in three remarkable variables and indicators from INNOVS-CKM proposed model.

Keywords: Competitive Advantage, Innovation Stages, Customer Knowledge Management.

JEL Classification: M10, O32.

RESUMEN

La innovación es dividida en etapas (INNOVS) para incrementar la ventaja competitiva. Cuando la innovación mejora la administración del conocimiento en las Firmas, basado en el sentido: para, desde y acerca de los consumidores es llamado: administración del conocimiento del consumidor (CKM). El propósito de éste estudio es el determinar: ¿Cuáles son los factores determinantes que existen entre INNOVS con CKM? Un cuestionario fue aplicado a 200 PyMES del sector de desarrollo de software en Guadalajara (SDSG), México aplicando análisis de regresión múltiple por etapas. Los resultados apuntaron a detallar 3 variables relevantes con indicadores, del modelo conceptual propuesto INNOVS-CKM.

Palabras clave: Ventaja Competitiva, Etapas de Innovación, Gestión del Conocimiento del cliente.

Clasificación JEL: M10, O32.

1. INTRODUCTION

In nowadays, are considered amongst others important key factor to develop competitiveness: INNOVS (Chesbrough et al. 2006) and the CKM (Garcia-Murillo & Annabi, 2002). Therefore, this study is aimed to identify the INNOVS variables, dimensions and indicators that are predominant on the CKM of the 200 SME´s belonging to the SDSG; they are considered as one of the most successful industrial sectors in the creation of innovation. This work is divided into the explanation of: 1) contextual reference, problem, research questions, hypotheses and rationale for the study; 2) the theoretical framework, which is a collection of concepts about INNOVS and CKM, closing with the design of the questionnaire; 3) methodology; 4) Results; 5) Analysis of Results and Discussion and finally, 6) Conclusions. One sector that is considered successful, fast-growing and highly dependent on value creation and innovation generation is the SDS. According To INEGI (2013), in Guadalajara City (GC) located in Jalisco state, there are around 200 firms that are directly or indirectly related with SDS, which have opportunities to develop them into the Digital Creative City program. The project was officially announced on January 30, 2012 by President Felipe Calderon, to enable 1000 acres, with an investment close to 1000 million USD looking for create 20,000 jobs in 10 years. Disney, Pixar Studios and Disney already have shown interest in joining to the *Jaliwood* concept of Mexico.

The Global Innovation Index Report (INSEAD, 2013) places México on site 63/142 that is reflected in its level competitiveness level, which is located on site 55/144 according to The Global Competitiveness Report 2013-2014 (WEF, 2014). Hence the importance of identifying and promoting in a systematic way, the major factors such as the relation between INNOVS and CKM to get more and new competitive advantage.

2. PROBLEM, HYPOTHESES AND RATIONALE OF THE STUDY

So, our problem is described in a general question (GQ):

GQ: ¿Which are the determinant factors of INNOVS that influence the CKM?; By other hand, the specific questions (as SQ), are:

SQ1. What is the scheme of the conceptual model?

SQ2. Which are the variables, dimensions and indicators?

SQ3. Which are variables and indicators more significant in the model?

Our hypotheses (H) are:

H1.-From the current knowledge and practice about INNOVS concepts and the importance given by SDSGC firms to the CKM, different INNOVS components are present in at least, on 50% of the variability of CKM.

H2.- The most detereminant factors of INNOVS produce, more than the 40% of the CKM variability in the SDSGC.

3. THE IMPORTANCE OF INNOVATION AND CUSTOMER KNOWLEDEGE MANAGEMENT RELATIONSHIP FOR COMPETITIVENESS

The competitiveness recognizes the potential of the CKM and INNOVS (Hill & Jones, 2011: 50-70; Loudon & Loudon, 2012: 100-300). Many authors have tried to identify different senses of CKM information like: for, from, about and to co-create (Nambisan, 2002;1-10; Desouza, Awazu, Jha, Dombrowski, Papagari, & Baloh, 2007:1-12; Nicolai, Keld & Pedersen, 2011;1-10). Even more, there are efforts to determine the Negative side effects of Customer Integration (Gassmanna, Kausch & Enkel,2012:1-22). The importance of how the knowledge can be supported by means of the human resources, the exchange amongst them, the rewards (Nicolai; Keld & Pedersen, 2011;1-10; OECD, 2003:1-198; Gebert, Geib, Kolbe, & Riempp, 2013:1-10; Gloet & Samson ,2013:1-10) and the influence of the Information and Communication Technologies (ICT) (Laudon & Laudon ,2012:100-300) is evident to boost the innovation stages. The firm must keep special care about the internal and external sources of information and how to extract them for CKM process (Baker & Hart, 2007:1-10; Garcia-Murillo & Annabi, 2002:1-18; Gebert, Geib, Kolbe, & Riempp, 2013:1-18). It´s important to remark the results around the terms of satisfaction, experience and performance as principal indicators of the CKM (Garcia-Murillo & Annabi, 2002:1-18).

3.1. Innovation and their Stages (INNOVS)

The competitiveness recognizes the potential of the Innovation (OCDE, 2005:1-198; Hill & Jones, 2011:50-70, Loudon & Loudon, 2012:100-300; Chesbrough, 2006:1-200; McKinsey, 2008: 1-20) and its different stages (Rothwell, 1994:1-5; Rogers, 1984:1-100). According to DRAE (2014), the word innovation comes from the latin *innovatio,-ōnis* and means: 1. f. Action and effect to innovate, and 2. f. Creating or modifying a product. For the Oslo Manual (OECD, 2005: 50-56) innovation is: *the introduction of a new or significantly improved product (good / service), process, a new marketing method, or a new organizational method in the internal business practices, the workplace organization or external relations, so it is not just limited to the field of technology, product or services*. Also, OECD (2005: 30-.37) recognize the process of creative destruction, enunciated by Schumpeter, which raises two types of innovations: the radicals that contribute to major changes in the world and, the incrementals, happening on an ongoing change process. In this sense, I quote The Rogers Innovation Bell (1984:1-100), that divides the innovation market in: a.-the innovators (they are very careful to use the latest in technology, and very important to communicate and spread); b.- early adopters (people considered as opinion leaders and influence their environment but are very careful to suggest and / or use the latest innovations); c.-early majority (conservative people, but open to technological change with some level of

careful to adopt it); d.-late majority (consumers particularly skeptical to the use of innovations until a large number of his acquaintances, has adopted it); 5.-the laggards (very traditional people maintaining the old forms; they hardly accept any changes and adapt to them until they become a habit even.). Other attempt to stablish different innovation stages, is the proposal of Rothwell (1994:1-5), determining different Innovation Models, such as: a) First Generation: *Technology-Push*; b) Second Generation: *Market-Pull*; c) Third Generation: *Coupling Model*; d) Fourth Generation: *Integrated Innovation Process*; e) Fifth Generation: *System Integration and Networking*.

3.2. The Innovation Model

The other one additional attempt to explain and predict how the industrial sectors, such as the Software Development Sector in Guadalajara, México is the model of *Innovation Stages* (INNOVS), is proposed by Mejía-Trejo, J., Sánchez-Gutiérrez, J.& Ortiz-Barrera, M. (2013b:1-20); briefly the conceptual model involves 6 variables:

a) *Innovation Value Added* (IVADD), or *the real proposal of intention,* where several agents, beside the customer are in interaction, such as: the shareholder, the Firm, the sector, the society, cost & risk of decisions (Bonel, J. I., Bonel, F. J., & Fontaneda; 2003: 20-50). An attempt to get the relation value-price, I consider the model created by Gale & Chapman, (1994:1-180), which is a proper model to relate, the customer emotions and desires to identify the attributes of products and services (Chaudhuri,.2006: 1-15; Mejía-Trejo, J. & Sánchez-Gutiérrez, J., 2013a : 1-80).

One of the latest model, that involves clearly the value added aimed to the client, is the *Business Model Generation* created by Osterwalder & Pygneur (2010: 1-180), with 9 stages to identify: customer segment; value proposition; channels; customer relationships; revenue streams; key resources; key activities; key partnerships and cost structure.

b) *Innovation Income Items* (IIIT), or *the igniting process,* where is considered the early innovation, describing: opportunities, analysis, idea generation, idea selection and the concept definition (Kausch, C., Gassmanna, O., & Enkel, E. 2012: 1-20). By the hand of the facilities for innovation Shipp (2008: 20-50) and McKinsey (2008: 1-20) define the scope of Research & Development (R&D) staff and tangibles to support the innovation. As an intangible assets to the process of innovation I take the efforts to use and generate patents, create and improve databases, to improve the organizational processes by meaning of the knowledge and skills and the decisions to increase its availability to the risk (Canibano, 1999; Shipp, 2008: 1-10; Lev, 2001: 1-10; Howells, 2000: 1-10). The efforts to discover new market knowledge (Popadiuk & Wei-Choo, 2006: 1-18), is considered too.

c) *Innovation Process* (INPROC), or *motor of the model*. Take in account the concepts around actions to improve the existing processes of Research & Development + Innovation (Shipp, 2008: 1-10; McKinsey, 2008: 1-20; OECD, 2005: 1-198), studies about product lifecycle (Gale & Chapman, 1994: 1-180). The design is an special issue, and includes actions to improve the existing design (OECD, 2005: 1-1998) and the employee influence based on its own autonomy to make opinions and decisions (Nicolai; Keld & Pedersen, 2011: 1-20). The open innovation concepts, as a last trend are considered Chesbrough (et. al 2006) due to the chances to discover at the same time of R&D, new markets. The results of innovation are around on prototypes and conceptual models that tend to improve the actual production process (OECD, 2005; Chesbrough, 2006; McKinsey, 2008).

The diffusion of innovation (and very related with lifecycle products) is important for marketing because the prevision of obsolete products, the changes in the market, the early adopters, the early majority, the late majority, the laggards described all above by mean of Rogers's Diffusion Innovation Model (1983). The onset and end of a technology is included as a market study that influences the innovation (Afuah, 1997; Dussauge & Ramantsoa, 1992: 1-8).

d) *Innovation Outcome Items* (IOIT), or *qualification of innovation stage*, which makes a revision of products and services obtained. Detects the projected level of revenues generated by innovation (Shipp, 2008: 1-18), the projected customer satisfaction level generated by innovation (McKinsey, 2008: 1-18), the projected sales percentages levels generated by innovation (Lev, 2001: 1-20), the level of the number of launches of new products/services in a period and the net present value of its portfolio of products / services in the market generated by the innovation (McKinsey, 2008: 1-10).

e) *Innovation Performance* (IPERF), or the *quantification of innovation stage*, makes different ponderations about the results to determine different levels, such as Bermúdez-García, (2010: 1-50), proposes:
   - Cost-Benefit of Innovation = Innovation income / Investment in Innovation;
   - Opportunities Index for Collaborative Innovation = Innovation Identified Opportunities / Total Contributors on the Process
   - Generation Ideas Rate= Generated Ideas / Market Knowledge Opportunities x Total Contributors on Process;
   - Effectiveness of Idea Generation = Number of Approved Ideas / Number of Generated Ideas;
   - Implementing Effective Prototyping = Number of Correct and Timely Prototype Terminated/ Total Prototyping Approved;

- Innovation Generation Rate= Number of Generated Innovations / Identified Innovation Opportunities:
- Index not Successful Innovations = Number of unsuccessful innovations implemented / Total Innovation, or other similar to quantify the final results. And,
- Triple Helix Politics = The relationship among university- government-industry Smith & Leydesdorff, (2010: 1-10), to develop the innovation as a policy of innovation, is considered too.

f) *Innovation Feedback Items* (IFEED), or alarm set of innovation stage, makes different analyses aimed to improve the subject versus the marginal profits. It involves: the intellectual capital dedicated to innovation (Lev, 2001:1-5; Shipp, 2008: 1-5; Nicolai, et al., 2011: 1-8); the processes, the product/service/, marketing, technology, organization: structure and functions, type of innovation (radical, incremental), (OECD, 2005: 1-198), value added (Bonel, et al. 2003: 1-10; Osterwalder & Pygneur, 2010: 1-180; Gale & Chapman, 1994: 1-180), and type of leadership (Gloet & Samson, 2013: 1-10: Mejía-Trejo, et al.,2013b: 1-10)

3.3. The Customer Knowledge Management (CKM)

To complement our proposed model of Innovation Stages (INNOVS), we did a revision and analysis of literature review about authors and their works about *Customer Knowledge Management* (CKM). Briefly, the results are described in 4 variables:

g) *CKM as a Driver of Innovation* (CKMADI), or *boost of Customer Knowledge Management* (CKM) where is considered the sense of information: from, about customer (Nambisan, 2002: 1-8; Desouza , et al., 2007: 1-8; Gibbert & Probst,2002:1-8; Garcia-Murillo & Annabi, 2002:7-10) and customer as a co-creator (Nicolai et al., 2011:7-12; Desouza, et al., 2007: 8-12; Gibbert & Probst, 2002; 9-15) making *prosumerism* to get more interaction with the customer knowledge.

Even more, the Negative side effects of Customer Integration such as the warning of the firm, respect of: customer´s personality, experience, points of view, the likelihood to choose a wrong customer, and the risk to incorporate him into the relationship to the Firm (Kausch, et al., 2014: 10-14) takes it at all, account into the model.

h) *CKM Support* (CKMS), or *basis of knowledge* consists in knowledge incentives, respect of: the salary associated with the ability and willingness to share knowledge (Nicolai et al., 2011: 8-12; OECD 2003: 10-17);It includes the salary determined by willingness to improve skills and upgrade knowledge;

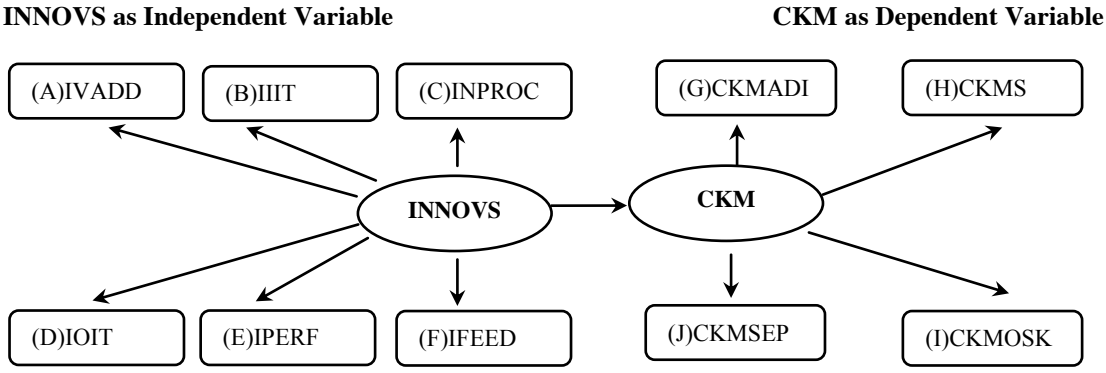
the tolerance to failure and rewards and recognition (Gloet & Samson, 2013: 5-9).

By other hand, we considered the fact of how the knowledge flows, through exchange the knowledge between employees across departments, communication among employees and management.

i) *CKM other Sources of Knowledge* (CKMOSK) or *different sources of knowledge* is a strategic tool, in the Information and Communication Technologies (ICT) as an infrastructure to support.

Customer Knowledge Management (CKM) (Laudon & Laudon, 2012: 100-200; Mejía-Trejo & Sánchez- Gutierrez, (2013a: 1-20), that is a powerful driver to boost the internal sources of knowledge from the environment, such as: technical services, engineering, R&D, production, marketing and sales and purchasing and supply, belonging to the firm´s departaments (Baker & Hart, 2007; Garcia-Murillo& Annabi, 2002: 5-15) and other employees into the same Firm (Murillo & Annabi ,2002: 5-15). As a complement, we decided the introduction of the external sources of knowledge, that involves: suppliers, scientists, Universities, Patents, Technology Exhibitions, distributor agents, and Consultant (Baker & Hart, 2007; Garcia-Murillo & Annabi, 2002: 3-10) evenly the competitors.

Figure 1. GENERAL CONCEPTUAL MODEL



Source: Own by Authors adaptation

a) *CKM, Satisfaction, Experience And Performance* (CKMSEP), or *satisfaction with knowledge;* one important issue that I considered essential to be determined, is the type of paradigm practiced by the Firm for *Customer Knowledge Management* (CKM)(Garcia-Murillo & Annabi ,(2002: 3-10). Due this, exist different paradigms that involve the performance on three levels to determine Customer Retention, Satisfaction, Experience-Creativity and Performance: Knowledge Management (KM); Customer Relationship Management (CRM) and Customer Knowledge Management (CKM). Such paradigms, are: If Only We Know What We Knew (KM) as a Customer

Retention, Retention is Cheaper than Acquisition (CRM) as a Customer Satisfaction, If We Only Knew What Our Customer Know (CKM) as a Customer Experience an Creativity. Finally to these variables, is proposed the performance against financial Budget with three levels: Customer retention rate (KM). Performance in terms of customer satisfaction and loyalty (CRM) and performance against competitors in innovation and growth; contribution to customer success. (CKM) (Garcia-Murillo & Annabi, 2002: 3-10). As a result of the documentary analysis we obtained the Figure 1.

4. METHODOLOGY

This is a descriptive and transversal study; it is based on documental research, to design a conceptual model and questionnaire to obtain several groups of variables, dimensions and indicators that involves a relationship between INNOVS and CKM. The subjects of the study were the managers from 200 SME´s SDSG. The results were analyzed through statistical inference tools like: Cronbach's Alpha in pilot test and Multiple Regression Analysis (MRA) with Stepwise method, contained in the SPSS 20 program.

5. RESULTS

To answer SQ2 we present the Scheme 1 with 10 variables, 45 dimensions and 110 indicators.

Scheme 1. Final Questionnaire showing INNOVS and CKM

INNOVATION STAGES				
V	DIMENSION	INDICATOR	Q	AUTHOR
A	1).-Emotions & Desires of Customer (VAEDC)	The innovation actions are aimed to increase the Emotions & Desire of the Customer	1	Chaudhuri (2006)
	2).-Cost & Risk (VACR)	The Cost is the main constraint to increase the value (VACR1)	2	Bonel (et al.,2003)
		The Risk is the main constraint to increase the value (VACR2)	3	
	3).-Customer (VACUS)	The innovation actions are aimed to increase the Customer value	4	
	4).-Shareholder (VASHO)	The Innovation actions are aimed to increase the Shareholder value	5	
	5).-Firm (VAFRM)	The innovation actions are aimed to increase the value of the Firm	6	
	6).-Sector (VASEC)	The innovation actions are aimed to increase the value of the Sector	7	
	7).-Society (VASOC)	The innovation actions are aimed to increase the value to the Society	8	
	8).-Price Value Relation (VAPVR)	The innovation is introduced to the market considering the relation price-value added	9	Gale & Chapman (1994
B	9).-Early Innovation Phase (EIPH)	Opportunity Identification (EIPH1)	10	Kausch (et al. 2014)
		Opportunity Analysis (EIPH2)	11	
		Idea Generation (EIPH3)	12	
		Idea Selection (EIPH4)	13	
		Concept Definition (EIPH5)	14	
	10).-Facilities for	Provides the most sophisticated equipment to support innovation	1	Shipp (et al.

	Innovation (Tangibles, FFI)	(FFI1)	5	2008); McKinsey (2008)
		Invests in R&D+I (FFI2)	16	
		Assigns staff to R& D+I (FFI3)	17	
	11).-Efforts for Innovation (Intangible assets, EFFI)	Makes efforts to use and / or generate Patents (EFFI1)	18	Canibano (1999); Shipp (et al. 2008); Lev (2001); Howells (2000)
		Makes efforts to create and / or improve Databases (EFFI2)	19	
		Makes efforts to improve the organizational processes (EFFI3)	20	
		Makes efforts to use the most of knowledge and skills of staff (EFFI4)	21	
		Makes planned decisions to increase its availability to the risk (EFFI5)	22	
		Makes efforts to discover New Market Knowledge (EFFI6)	23	Popadiuk & Wei-Choo (2006)
		Makes efforts to study the Existing Market Knowledge (EFFI7)	24	
C	12).-Research & Development + Innovation (RDI)	Makes actions to improve existing processes of Research & Development + Innovation (RDI1)	25	Shipp (et al.,2008); McKinsey (2008); OECD (2005)
		Makes studies about Product Lifecycle (RDI2)	26	Gale & Chapman (1994)
	13).- Design (DSGN)	Makes actions to improve the existing design (DSGN1)	27	OECD (2005)
		Employees have influence on their job (DSGN2)	28	Nicolai (et al., 2011)
		Employees engaged in teams with high degree of autonomy (DSGN3)	29	
		The strategy is based on Open Innovation concepts (DSGN4)	30	Chesbrough (et. al 2006)
	14).-Prototypes (IPPFI)	Makes actions to develop prototypes for improvement	31	Chesbrough (2006); McKinsey (2008)
	15).-Pre-Production (IPPPIP)	Makes improvement actions to pre-production	32	
	16).-Market Research (MR)	Makes to investigate market needs of obsolete products (MR1)	33	Chesbrough (et. al. 2006);Rogers (1984)
		Makes to investigate the needs actions and / or market changes for innovators (MR2)	34	
		Makes to investigate needs and / or market changes for early adopters (MR3)	35	
		Makes to investigate needs and / or market changes for early majority (MR4)	36	
		Makes to investigate needs and / or market changes for late majority (MR5)	37	
		Makes to investigate needs and / or market changes for laggards (MR6)	38	
		Makes to investigate the onset of a new technology (MR7)	39	Afuah (1997)
		Makes to investigate the term of a technology (MR8)	40	
	17).-Novelty (NOVY)	Decides actions to improve or introduce new forms of marketing (NOVY1)	41	Lev (2001)
		Seeks to be new or improved in the World (Radical Innovation) (NOVY2)	42	OECD (2005); Afuah (1997)
		Seeks to be new or improved to the Firm (Incremental Innovation) (NOVY3)	43	
		Seeks to be new or improved in the region (Incremental Innovation) (NOVY4)	44	
		Seeks to be new or improved in the industry (Incremental Innovation) (NOVY5)	45	
	18).-Training (TRAI)	Makes actions to train the staff continuously (Incremental Innovation)	46	
	19).-Type of Innovation (TOINN)	Makes actions to innovate in technology (TOINN1)	47	
		Makes actions for innovation in production processes (TOINN2)	48	
		Makes actions to improve or introduce new products forms (TOINN3)	4	

			9	
		Makes actions to improve or introduce new forms of service (TOINN4)	50	
		Makes actions to improve or introduce new organizational structures and functions (TOINN5)	51	
		Innovation activities tend to be rather radical (TOINN6)	52	
		Innovation activities tend to be incremental (TOINN7)	53	
D	20).-New products/ and/or services (NPSD)	Detects the projected level of revenues generated by innovation (NPSD1)	54	Shipp (et al. 2008);
		Detects the projected customer satisfaction level generated by innovation (NPSD2)	55	McKinsey (2008)
		Detects the projected sales percentages levels generated by innovation (NPSD3)	56	Lev (2001)
		Detects the level of the number of launches of new products/services in a period (NPSD4)	57	McKinsey (2008)
		Detects the net present value of its portfolio of products / services in the market generated by the innovation (NPSD5)	58	
E	21).-Cost-Benefit of Innovation (PCBOI)	Do you use an indicator like: Innovation income / (Investment in Innovation) ?	59	Bermúdez-García (2010)
	22).-Opportunities Index for Collaborative Innovation (POIFCI)	Do you use an indicator like: Innovation Identified Opportunities / (Total Contributors on the Process)?	60	
	23).-Generation Ideas Rate (PGIR)	Do you use an indicator like: Generated Ideas / (Market Knowledge Opportunities x Total Contributors on Process)?	61	
	24).-Effectiveness of Idea Generation (PEOIG)	Do you use an indicator like: Number of Approved Ideas / (Number of Generated Ideas)?	62	
	25).-Implementing Effective Prototyping (PIEP)	Do you use an indicator like:Number of Correct and Timely Prototype Terminated / (Total Prototyping Approved)?	63	
	26).-Innovation Generation Rate (PIGR)	Do you use an indicator like: Number of Generated Innovations / (Identified Innovation Opportunities)?	64	
	27).-Index not Successful Innovations (PINSI)	Do you use an indicator like: Number of unsuccessful innovations implemented / (Total Innovation)?	65	
	28).-Triple Helix Politics (PTHP)	Does exist any relationship among : university- government- industry, to develop the innovation?	66	Smith & Leydesdorff, (2010)
F	29).-Capital (IFCAP)	Based on the results identifies intellectual capital dedicated to innovation for its improvement	67	Lev(2001);Shipp (et al. 2008); Nicolai (et al., 2011)
	30).-Product & Process (IFPP)	Based on the results identifies the stages of new or improved process for upgrading (IFPP1)	68	OECD (2005); Chesbrough (2006)
		Based on the results identifies attributes of new or improved product / service for its improvement (IFPP2)	69	
	31).-Innovation (IFINN)	Based on the results identifies the stages of new or improved form of marketing for improvement (IFINN1)	70	
		Based on the results identifies the stages of new or improved technology for improvement (IFINN2)	71	
		Identifies the stages of the new or improved structure and functions of the organization to its improvement (IFINN3)	72	
		Identifies the type of innovation (radical or incremental) that has given best results (IFINN4)	73	
	32).-Value Aded (IFV)	Based on the results identifies the new or improved value proposition (benefits / costs) for its completion; relation value-price	74	Bonel (et al.,2003)
	33).-Leadership and Innovation (FLINNO)	The type of leadership that drives innovation is Transactional (FLINNO1)	75	Mejía-Trejo (et al., 2013), Gloet & Samson (2013)
		The type of leadership that drives innovation is Transformational (FLINNO2)	76	
		The type of leadership that drives innovation is Passive (FLINNO3)	77	
CUSTOMER KNOWLEDGE MANAGEMENT				

G	34).-Information from Costumer (IFMC)	Customer is a Resource of NPD ideation; Customer Driven-Innovation (Innovation from Customers). Mutual Innovation.	78	Nambisan (2002); Desouza (et al., 2007); Gibbert (et. al, 2002)
	35).-Information about the Customer (IABC)	Strategy of close collaboration with customers. Communities of creation.	79	Nambisan (2002); Gibbert (et. al, 2002)
	36).-Information for Customer (IFRC)	Customer as a User collaborates intensively in the product testing and support. Customer Focused Innovation (Innovation for Customers)	80	Nambisan (2002); Desouza (et al., 2007)
	37).-Information as a Customer Co-creator (with) (IWIC)	Customer as a Co-creator helps over NPD design and development; Customer Centered Innovation (Innovation with Customers); Prosumerism; Team-Based-CoLearning. Joint Intellectual Property	81	Nicolai (et al., 2011); Desouza (et al., 2007); Gibbert (et. al, 2002)
	38).-Negative side effects of Customer Integration (NSEC)	The firm is warned about the dependence on customer´s personality (NSEC1)	82	Kausch (et al. 2014)
		The firm is warned about the dependence on customer´s experience (NSEC2)	83	
		The firm is warned about the dependence on customer´s point of view (NSEC3)	84	
		The firm is warned about to choose the wrong customer (NSEC4)	85	
		The firm is warned about the risk to integrate the customer to the company´s side (NSEC5)	86	
H	39).-Knowledge Incentives (KI)	Salary associated with the ability and willingness to share knowledge (KI1)	87	Nicolai (et al., 2011); OECD (2003)
		Salary determined by willingness to improve skills and upgrade knowledge (KI2)	88	
		Tolerance of Failure (KI3)	89	Gloet & Samson (2013)
		Rewards and Recognition (KI4)	90	
	40).-Knowledge Fluence (KF)	Exchange the knowledge between employees across departments (KF1)	91	Nicolai (et al., 2011); OECD (2003)
		Communication among employees and management (KF2)	92	
	41).-Knowledge and ICT (KICT)	ICT to support and control the Customer Knowledge Management	93	Laudon & Laudon (2012); Mejía-Trejo & Sánchez-Gutierrez (2013)
I	42).-Internal Sources of Knowledge (ISOK)	Technical Services (IOSK1)	94	Baker & Hart (2007); Garcia-Murillo & Annabi (2002)
		Engineering Department (IOSK2)	95	
		Research and Design Development (IOSK3)	96	
		Production (IOSK4)	97	
		Marketing and Sales (IOSK5)	98	
		Purchasing and Supply (IOSK6)	99	
		Other Employees (IOSK7)	100	Murillo & Annabi (2002)
	43).-External Sources of Knowledge (ESOK)	Supplier (ESOK1)	1	Baker & Hart (2007); Garcia-Murillo & Annabi (2002)
		Scientist, Universities, Patents, Exhibitions Technological Consultant (ESOK2)	2	
		Distributor Agents (ESOK3)	3	
		Competitor (ESOK4)	4	
J	44).-Paradigm (PAR)	If Only We Know What We Knew (KM) as a Customer Retention (PAR1)	5	Garcia-Murillo & Annabi (2002)
		Retention is Cheaper than Acquisition (CRM) as a Customer Satisfaction (PAR2)	6	
		If We Only Knew What Our Customer (CKM) Know as a Customer Experience and Creativity (**PAR3**)	7	
	45).-Performance	Performance against budget; Customer retention rate.(KM) (**PER1**)	8	

	(**PER**)	Performance in terms of customer satisfaction and Loyalty (**PER2**)	9	
		Performance against competitors in innovation and growth; Contribution to customer success. (CKM) (**PER3**)	10	

Notes: Variables (V); (A).-Innovation Value Added (IVADD); (B).-Innovation Income Items (IIIT); (C).-Innovation Process (INPROC); (D) Innovation Outcome Items (IOIT); (E).- Innovation Performance (IPERF); (F).- Innovation Feedback Items (IFEED); (G).- CKM as a Driver of Innovation (CKMADI) ; (H).- CKM Support (CKMS); (I).- CKM other Sources of Knowledge (CKMOSK); (J).- CKM, Satisfaction, Experience And Performance (CKMSEP).
Source: Authors by own adaptation

In the next section, we showed the results about the multivariant statistics started by: Cronbach's alpha (questionnaire test confidence); Multiple Regression Analysis by Stepwise Method showing first: Pearson's Correlations; variable entered / removed; model summary; ANOVA Table; Coefficients Table; excluded variables table. All above mentioned, to determine the determinant factors of INNOVS related with CKM. The result of that, is TOINN4 (*Makes actions to improve or introduce new forms of service*, see table 8) and how is compared with the rest of their other indicators. Applying the statistical inference tools from SPSS 20 program, were obtained: the questionnaire confidence to 20 CEOs of SDSG by Cronbach's Alpha test =.947 (see Table 1).

Table 1. Cronbach's Alpha Test

Cronbach's Alpha	Standardized Alpha	N of Cases	N of Variables
.947	.948	20	110

Source: SPSS 20 as a result of the research and adapted by the authors

MRA by Stepwise Method was practiced with the next results:

Table 2 shows the Correlations amongst the variables.

Table 2. Pearson's Correlation

		CKM	IVADD	IIIT	INPROC	IOIT	IPERF	IFEED
Pearson Correlation Coefficient	CKM	1.000	.140	.533	.655	.519	.564	.237
	IVADD	.140	1.000	.164	.134	.170	.179	.051
	IIIT	.533	.164	1.000	.550	.448	.465	.253
	INPROC	.655	.134	.550	1.000	.562	.481	.239
	IOIT	.519	.170	.448	.562	1.000	.625	.314
	IPERF	.564	.179	.465	.481	.625	1.000	.448
	IFEED	.237	.051	.253	.239	.314	.448	1.000

Source: SPSS 20 as a result of the research and adapted by the authors.

Table 3 shows the set of variables entered/removed (a).

Table 3. Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method Stepwise
1	INPROC		Criteria: Probability of- F-to-enter<= .050, Probability of- F-to-remove >=.100
2	IPERF		
3	IIIT		

(a) Dependent Variable: CKMS

Source: SPSS 20 as a result of the research and adapted by authors.

Table 4 shows the Model Summary.

Table 4. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error for estimate
1	.655 (a)	**.429**	.426	.463
2	.714 (b)	**.510**	.505	.430
3	.727 (c)	**.528**	.521	.423

(a) Predictors: (Constant), INPROC;

(b) Predictors: (Constant), INPROC, IPERF

(c) Predictors: (Constant), INPROC, IPERF, IIIT

Source: SPSS 20 as a result of the research.

Using the Stepwise method SPSS produces an ANOVA for each model

Table 5 shows the Analysis of Variance (ANOVA).

Table 5. ANOVA (a)

Model	Sum of Squares	Df	Mean Square	F	Sig.
1					
Regression	31.891	1	31.891	148.821	.000(b)
Residual	42.429	198	.214		
Total	74.320	199			
2					
Regression	37.884	2	18.942	102.417	.000(c)
Residual	36.436	197	.185		
Total	74.320	199			
3					
Regression	39.232	3	13.077	73.050	.000(d)
Residual	35.088	196	.179		
Total	74.320	199			

(a) Dependent Variable: CKMS; (b) Predictors: (Constant), INPROC

(c) Predictors: (Constant), INPROC, IPERF; (d) Predictors: (Constant), INPROC, IPERF, IIIT. Source: SPSS 20 as a result of the research.

Table 6 shows the results of Coefficients.

Table 6. Coefficients by Stepwise Method (a)

Model		Unstandardized Coefficients		Standardized Coefficients	t.	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.733	.166		10.433	.000
	INPROC	.509	.042	.655	12.199	.000
2	(Constant)	1.250	.176		7.093	.000
	INPROC	.388	.044	.499	8.770	.000
	IPERF	.232	.041	.324	5.693	.000
3	(Constant)	1.010	.194		5.204	.000
	INPROC	.332	.048	428	6.935	.000
	IPERF	.201	.042	.280	4.813	.000
	IIIT	.163	.059	.168	2.744	.007

(a) Dependent Variable: CKM

Source: SPSS 20 as a result of the research.

Table 7 shows the Excluded Variables on Table 7.

Table 7. Excluded Variables (a)

Model	Beta in	t	Sig.	Partial Correlation	Collineartity Tolerance
1					
IVADD	.054(b)	.993	.322	.071	.982
IIIT	.248(b)	4.004	.000	.274	.697
IOIT	.221(b)	3.502	.001	.242	.684
IPERF	.324(b)	5.693	.000	.376	.768
IFEED	.085(b)	1.545	.124	.109	.943
2					
IVADD	.016(c)	.320	.750	.023	.965
IIIT	.168(c)	2.744	.007	.192	.645
IOIT	.070(c)	1.017	.310	.072	.521
IFEED	-.035(c)	-.619	.537	-.044	.799
3					
IVADD	.006(d)	.116	.908	.008	.959

IOIT	.056(d)	.813	.417	.058	.518
IFEED	- .042(d)	-.761	.448	-.054	.797

(a) Dependent Variable: CKMS; (b) Predictors: (Constant), INPROC
(c) Predictors: (Constant), INPROC, IPERF; (d) Predictors: (Constant), INPROC, IPERF, IIIT. Source: SPSS 20 as a result of the research.

Doing the same MRA for the INPROC, IPERF and IIIT Indicators on CKM, we found Table 8, about analysis of Type of Innovation (TOINN).

Table 8. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error for estimate
1	.672(a)	**.452**	.449	.454
2	.739(b)	**.545**	.541	.414
3	.763(c)	**.582**	.576	.398
4	.779(d)	**.607**	.599	.387
5	.789(e)	**.622**	.612	.381
6	.796(f)	**.634**	.623	.375

(a) Predictors: (Constant), TOINN4; Predictors: (Constant), TOINN4,MR2
(b) Predictors: (Constant), TOINN4,MR2,MR7; Predictors: (Constant), TOINN4,MR2,MR7,PEOIG; Predictors: (Constant), TOINN4,MR2,MR7,PEOIG,NOVY3; Predictors: (Constant), TOINN4,MR2,MR7,PEOIG,NOVY3,TOINN2
Source: SPSS 20 as a result of the research.

Multiple Regression Analysis by Stepwise Method was practiced with the next results:

Table 9 shows the Correlations amongst the variables.

Table 9. Pearson's Correlation

	CK	**TOIN**	**TOIN**	**TOIN**	**TOIN**	**TOIN**	**TOIN**	**TOIN**
CK	1.0	.501	.560	.508	**.674**	**.634**	**.654**	.484
TOIN	.50	1.00	.693	.583	.710	.615	.548	.500
TOIN	.56	.693	1.00	.489	.717	.757	.682	.527
TOIN	.50	.583	.489	1.00	.663	.605	.503	.631
TOIN	**.67**	.710	.717	.663	1.00	.832	.802	.665
TOIN	**.63**	.615	.757	.605	.832	1.00	.788	.594
TOIN	**.65**	.548	.682	.503	.802	.788	1.00	.609
TOIN	.48	.500	.527	.631	.665	.594	.609	1.00

Source: SPSS 20 as a result of the research and adapted by the author.

Table 10 shows the set of variables entered/removed (a).

Table 10. Variables Entered/Removed

Model	Variables	Variables	Method Stepwise
1	TOIN		Criteria: Probability of- F-to-enter<= .050, Probability of- F- to-remove >= 100
2	TOIN		

(a) Dependent Variable: CKM

Source: SPSS 20 as a result of the research and adapted by author.

Table 11 shows the Model Summary.

Table 11. Model Summary

Mode	R	R Squar	Adjusted R	Std. Error for estimate
1	.674	**.454**	.451	.475
2	.700	**.490**	.485	.460

(a) Predictors: (Constant), TOINN4; (b) Predictors: (Constant), TOINN4, TOINN6

Source: SPSS 20 as a result of the research.

Using the Stepwise method SPSS produces an ANOVA for each model.

Table 12 shows the Analysis of Variance (ANOVA)**.**

Table 12. ANOVA(a)

Model	**Value**	**Sum of Squa**	**Df**	**Mean Square**	**F**	**Sig.**
1	**Regression**	37.109	1	37.109	164.572	.000(b)
	Residual	44.646	198	.225		
	Total	81.755	199			
2	**Regression**	40.090	2	20.045	94.777	.000(c)
	Residual	41.665	197	.211		
	Total	81.755	199			

(a) Dependent Variable: CKM; (b) Predictors: (Constant), TOINN4

(c) Predictors: (Constant), TOINN4, TOINN6

Source: SPSS 20 as a result of the research.

6. ANALYSIS OF RESULTS AND DISCUSSION

About Table 1 and according by Hinton (et al. 2004), Cronbach's alpha corresponds : 0.90 and above shows excellent reliability; 0.70 to 0.90 shows high reliability; 0.50 to

0.70 shows moderate reliability; 0.50 and below shows low reliability. Table 2,as a general rule, predictor variables can be correlated with each other as much as 0.8 before there is cause for concern about multicollinearity (Hinton, et al. 2004; Hair et al., 2010). Respect the Table 3, the Variables Entered/Removed table shows that the Stepwise method of regression has been used. Notice that SPSS has entered into the regression equation three variables: INPROC, IPERF and IIT that are significantly correlated with CKM. Table 4 shows the Models: 1, 2, and 3 where the independent variables INPROC, IPERF and IIIT accounts for 42.9 %, 51% and 52.8% respectively of the variance in the scores of CKM dependent variable. The R value (0.655) in Model 1 is the multiple correlation coefficients between the predictor variables and the dependent variable. As INPROC is the only independent variable in this model we can see that the R value is the same value as the Pearson's correlation coefficient in our pairwise correlation matrix.

In Model 2 the independent variables INPROC and IPERF are entered, generating a multiple correlation coefficient, R =.714. The Adjusted R Square adjusts for a bias in R square and is usually used. The Std. Error of the Estimate is a measure of the variability of the multiple correlations. Table 5, indicates Model 1: $F(1,198)= 148.821$, $p<0.01$; Model 2: $F(2,197)= 102.417$, $p<0.01$; Model 3: $F(3,196)=73.050$, $p<0.01$. Dividing the Sums of Squares by the degrees of freedom (df) gives us the Mean Square or variance. We can see that the Regression explains significantly more variance than the error or Residual. We calculate R2 by dividing the Regression Sum of Squares by the Total Sum of Squares. The values for Model 1 have been used as an example: 31.891/74.320= 0.4291. In Table 6 the Unstandardized Coefficients B column gives us the coefficients of the independent variables in the regression equation for each model. Model 1: CKMS = 1.733 + .509 INPROC; Model 2: CKMS = 1.250+ .388 INPROC+ .232 IPERF; Model 3: CKMS= 1.01+ .332 INPROC+ .201 IPERF+ .163 IIIT. The Standardized Beta Coefficient column informs us of the contribution that an individual variable makes to the model. The beta weight is the average amount the dependent variable increases when the independent variable increases by one standard deviation (all other independent variables are held constant). As these are standardized we can compare them. The t tests are performed to test the two-tailed hypothesis that the beta value is significantly higher or lower than zero. This also enables us to see which predictors are significant. By observing the Sig. values in our research we can see that for Model 1 the INPROC scores are significant ($p < 0.05$), and so on with Model 2 and 3. Hence, we suggest using Model 3 because it accounts for more of the variance.

The Unstandardized Coefficients Std. Error column provides an estimate of the variability of the coefficient. Table 7 .The Beta In value gives an estimate of the beta weight if it was included in the model at this time. The results of t tests for each independent variable are detailed with their probability values. From Model 1 we can see that the t value for IPERF is significant ($p < 0.05$). However as we have used the Stepwise method this variable has been excluded from the model. As IIIT has been

included in Model 2 it has been removed from this table. As the variable INPROC scores is present in the 3 models it is not mentioned in the Excluded Variables table. The Partial Correlation value indicates the contribution that the excluded predictor would make if we decided to include it in our model. Collinearity Statistics Tolerance values check for any collinearity in our data. As a general rule, a tolerance value below 0.1 indicates a serious problem (Hinton, et. al, 2004).

So far, we answered SQ3 since Table 3 that shows the most significant variables were INPROC, IPERF and IIIT from INNOVS. Therefore, GH1 is explained because using Table 4 Model 3, 52.8% produces the variability on the dependent variable CKM.

Table 9, as a general rule, predictor variables can be correlated with each other as much as 0.8 before there is cause for concern about multicollinearity (Hinton, et al. 2004; Hair et al., 2010). Table 10, shows the Variables Entered/Removed table shows that the Stepwise method of regression has been used. Notice that SPSS has entered into the regression equation, two variables: TOINN4 and TOINN6, those are significantly correlated with CKM.

Table 11 shows the Models: 1 and 2, where the independent variables TOINN4 and TOINN6 account for 45.4% % and 49% respectively, of the variance in the scores of CKM dependent variable. The R value (0.674) in Model 1 is the multiple correlation coefficients between the predictor variables and the dependent variable. As TOINN4 is the only independent variable in this model I can see that the R value is the same value as the Pearson's correlation coefficient in our pairwise correlation matrix. In Model 2, the independent variable TOINN6 is entered, generating a multiple correlation coefficient, R =.700. The Adjusted R Square adjusts for a bias in R square and is usually used. The Std. Error of the Estimate is a measure of the variability of the multiple correlations.

Table 12, indicates Model 1: $F(1,198)= 164.572$, $p<0.01$; Model 2: $F(2,197)= 94.777$, $p<0.01$; Dividing the Sums of Squares by the degrees of freedom (df) gives us the Mean Square or variance. We calculate R square by dividing the Regression Sum of Squares by the Total Sum of Squares. The values for Model 1 have been used as an example: 37.109/81.755= 0.454 (see Table 12).

We conclude finally, that the determinant factor of INNOVS related with CKM in firms around the SDSG, are more willingness to get results since Type of Innovation meaning: *Makes actions to improve or introduce new forms of service* (TOINN4), and: *Innovation activities tend to be rather radical* (TOINN6). As you see, there are more indicators about INNOVS and CKM, to get better results for competitive advantages.

7. CONCLUSIONS

We discovered a complete Innovation Stages (INNOVS) described with 6 variables (IVAAD, IIIT,INPROC,IOIT,IPERF, IFEED) with 33 dimensions and 77 indicators; our independent variable was IOIT; at the same time too, 4 variables (CKMADI, CKMS, CKMOSK, CKMSEP) with 12 dimensions and 33 indicators that are trying to explain CKM. The GQ is solved involving the relationship between INNOVS with CKM for 200 SMEs at SDCG when is answered the SQ1: obtaining the Figure 1 with 10 variables; SQ2 is answered by mean the description of variables in the Literature Review and the questionnaire design showed in Scheme 1 with 45 dimensions and 110 indicators associated to the variables; SQ3 is answered by means the variable correlations (Table 2) and the MRA by Stepwise Method (Tables: 3 , 4, 5,6 and 7) showing as the most significant variables: IPROC, IPERF, IIIT; in fact, GH is answered in a positive way because we found 52.3% (more than 50% proposed) of our model produces the variability on the dependent variable CKMS. Doing MLR again, IPROC, IPERF, IIIT we obtained Tables 8 that shows the most significant indicators: TOINN4, MR2, MR7, PEOIG, NOVY3, TOINN2 to improve CKM.

According the last results, we started the analysis about TOINN4 as a most important determinant factor of innovation (INNOVS) related with CKM, and we answered the SQ3 solved applying MRA between the dependent variable CKM, and the independent variable *Type of Innovation* (TOINN), discovering their indicators: *Makes actions to improve or introduce new forms of service* (TOINN4) and *Innovation activities tend to be rather radical* (TOINN6) as the most relevant indicators into *Type of Innovation* (TOINN) of Innovation Stages (INNOVS) that are related with *Customer Knowledge Customer* (CKM).

Two models that might be explain and predict the behavior of CKM, by mean of the indicators: *Makes actions to improve or introduce new forms of service* (TOINN4) and *Innovation activities tend to be rather radical* (TOINN6):

Model 1: CKMS = 2.073 + .430 TOINN4 and
Model 2: CKMS = 1.930+ .266 TOINN4+ .201 TOINN6

About the Hypothesis1 (H1) we had:
H2: The most important factor of INNOVS, specified by mean of TOINN4 produce, more than the 40% of the *Customer Knowledge Management* (CKM) variability in the Software Development Sector firms in Guadalajara, México. We found that *Makes actions to improve or introduce new forms of service* (TOINN4), *Innovation activities tend to be rather radical* (TOINN6) produce 49% (see Table 4) of the *Customer Knowledge Management* (CKM). Therefore, the H2 is accepted.

About future studies we propose a generalized model able to predict and explain the relationship between *Innovation* (INNOVS) and *Customer Knowledge Management* (CKM), where are related all the 110 indicators, through the use of Structural Equations Modelling (SEM). The aim, of this study is to discover additionally, the underlying or latent indicators that points out to raise the level of innovation and customer knowledge and achieve new competitive advantages to the sector.

As we see finally, there are great opportunities to use not only the 6 indicators mentioned above, but the rest of the 71/77 INNOVS indicators to improve CKM and get new and pretty important competitive advantages.

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