Type of innovation and customer knowledge management, in Mexico

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ABSTRACT

The Type of Innovation as an Innovation Process component, increases the competitive advantage of the firms. The Customer Knowledge Management, influences the Firm´s Process Innovation, based on the sense of information: for, from and about the customers, that increase the market opportunities. Hence, the aim of this paper is to determine the model and the most significant indicators from the Type of Innovation related with Customer Knowledge Management. We questioned 200 CEOs from the Software Developer Sector in Guadalajara City, México and by Using of the Inferential Statistics, we found only 2 relevant indicators from 7, situation that might be improved to rise new competitive advantages.

Keywords*: Innovation, Type of Innovation, Customer Knowledge Management.*

RESUMEN

El Tipo de Innovación, como un componente del Proceso de Innovación, incrementa la ventaja competitiva de las Firmas. La Administración del Conocimiento del Consumidor, ejerce influencia en el Proceso de Innovación de la Firma, basado en el sentido de la información: para, desde y acerca de los consumidores ya que incrementa las oportunidades del mercado. Así, el propósito de éste artículo es el de determinar el modelo y los más significativos indicadores que relacionan al Tipo de Innovación con la Administración del Conocimiento del Consumidor. Fueron consultados 200 ejecutivos líderes del sector de desarrollo de software de la ciudad de Guadalajara, Jalisco, , México y por medio del uso de Estadística Inferencial, se encontraron solamente 2 indicadores de 7, como relevantes, situación que debe ser mejorada para alcanzar nuevas ventajas competitivas.

Palabras Clave: Innovación, Tipo de innovación**,** Gestión del conocimiento del Cliente.

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INTRODUCTION

In nowadays, an important key factors to develop competitiveness, considered by several authors are: Innovation (Hill & Jones, 2011, Loudon & Loudon, 2012; Chesbrough, 2006; McKinsey, 2008) with its stages and types (**INNOVS**) (Rothwell, 1994, Rogers, 1984, OCDE, 2005) and the *Customer Knowledge Management* (**CKM**) (Garcia-Murillo & Annabi, 2002; Nambisan (2002); Desouza, K., Awazu, Y., Jha, S., Dombrowski, C., Papagari, S., Baloh, P., 2007; Gibbert & Probst,2002; Gebert, H., Geib, M., Kolbe, L., & Riempp, G.,2013). Innovation is conceived and divided in different stages (Rothwell, 1994). Here, I use the Mejía-Trejo, J., Sánchez-Gutiérrez, J.& Ortiz-Barrera, M. 2013b, model, implemented and proved in the Software Developer Sector in Guadalajara, México; in this paper, this model is improved and complemented with the concepts around the *Customer Knowledge Management* (**CKM**).

Therefore, this study is aimed to identify the *Type of Innovation* (**TOINN**) and indicators, inside of *Innovation Process* (**INPROC**) variable belonging to the Innovation Stages (**INNOVS**) from Mejía-Trejo (et. al, 2013b) Model and their relation with *Customer Knowledge Management* (**CKM**). So, I questioned 200 CEO's from the Software Developer Sector in Guadalajara City, México; they are considered as one of the most successful industrial sectors in the creation of innovation.

The study is considered pretty important by the sector, due that the findings are able to describe the strengths and the weakness of the policies and actions, around the innovation and the customer knowledge to planning new and better competitive advantages. (Porter, 2005; Hill & Jones, 2011)

This work is divided in: 1) contextual reference, problem, research questions, hypotheses and rationale for the study; 2) the literature review, which is a collection of concepts about *Innovation* with its different stages (**INNOVS**) and *Customer Knowledge Management* (**CKM**) concepts, concluding with the design of the questionnaire; 3) methodology; 4) analysis of results; 5) discussion and 6) conclusions.

CONTEXTUAL REFERENCE

One sector, that is considered successful, fast-growing and highly dependent on value creation and innovation generation is the Software Developer Sector. According to INEGI (2014), in Guadalajara City located in Jalisco state, México 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 Dreamworks already have shown their 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 Value Added as a component of Innovation and Customer Knowledge Management to get more and new competitive advantages.

PROBLEM, RESEARCH QUESTIONS, HYPOTHESES AND RATIONALE OF THE STUDY

So, our problem is described in a general question as **GQ**: ¿Which is the conceptual model that relates variables, dimensions and indicators from *Type of Innovation* (**TOINN**) into *Innovation Stages* (**INNOVS**) that influence the *Customer Knowledge Management* (**CKM**)?

By other hand, the specific questions (as **SQ**), are:

SQ1: What is the scheme of the model?;

SQ2: Which are the variables, dimensions and indicators?;

SQ3: Which are variables and indicators of Type of Innovation (**TOINN**) more significant into the model?

The general hypothesis proposed (**GH)** is:

GH: The most important indicators of *Type of Innovation* (**TOINN**) produce, more than the 40% of the *Customer Knowledge Management* (**CKM**) variability in the Software Development Sector firms in Guadalajara, México.

The rationale of the study is the importance by the Software Developer Sector, in México, to find out the strengths and the weakness of the policies and actions, around the innovation and the customer knowledge, to planning new and better competitive advantages.

LITERATURE REVIEW

Innovation and its Stages (INNOVS)

The competitiveness recognizes the potential of the Innovation (OCDE, 2005; Hill & Jones, 2011, Loudon & Loudon, 2012; Chesbrough, 2006; McKinsey, 2008) and its different stages (Rothwell, 1994; Rogers, 1984). 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, p.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, p.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 (1962), 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), 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*.

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); 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). An attempt to get the relation value-price, I consider the model created by Gale & Chapman, (1994), which is a proper model to relate, the customer emotions and desires to identify the attributes of products and services (Chaudhuri,.2006; Mejía-Trejo, J. & Sánchez-Gutiérrez, J., 2013a).

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), 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. By the hand of the facilities for innovation Shipp (2008) and McKinsey (2008) 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; Lev, 2001; Howells, 2000). The efforts to discover new market knowledge (Popadiuk & Wei-Choo, 2006), 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; McKinsey, 2008; OECD, 2005), studies about product lifecycle (Gale & Chapman,
1994). The design is an special issue, and includes actions to improve the existing design (OECD, 2005) and the employee influence based on its own autonomy to make opinions and decisions (Nicolai; Keld & Pedersen, 2011). 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).

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), the projected customer satisfaction level generated by innovation (McKinsey, 2008), the projected sales percentages levels generated by innovation (Lev, 2001), 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).

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), 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), 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; Shipp, 2008; Nicolai, et al., 2011); the processes, the product/service/, marketing, technology, organization: structure and functions, type of innovation (radical, incremental), (OECD, 2005), value added (Bonel, et al. 2003; Osterwalder & Pygneur, 2010; Gale & Chapman, 1994), and type of leadership (Gloet & Samson, 2013 Mejía-Trejo, et al., 2013b)

The Customer Knowledge Management (CKM)

To complement our proposed model of Innovation Stages (**INNOVS**), I 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; Desouza , et al., 2007; Gibbert & Probst,2002; Garcia-Murillo & Annabi, 2002) and customer as a co-creator (Nicolai et al., 2011; Desouza, et al., 2007; Gibbert & Probst, 2002) 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) 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; OECD 2003);It includes the salary determined by willingness to improve skills and upgrade knowledge; the tolerance to failure and rewards and recognition (Gloet & Samson, 2013).

By other hand, I 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; Mejía-Trejo & Sánchez-Gutierrez, 2013a), 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) and other employees into the same Firm (Murillo & Annabi ,2002). As a complement, I 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) evenly the competitors.

J.-*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). 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,

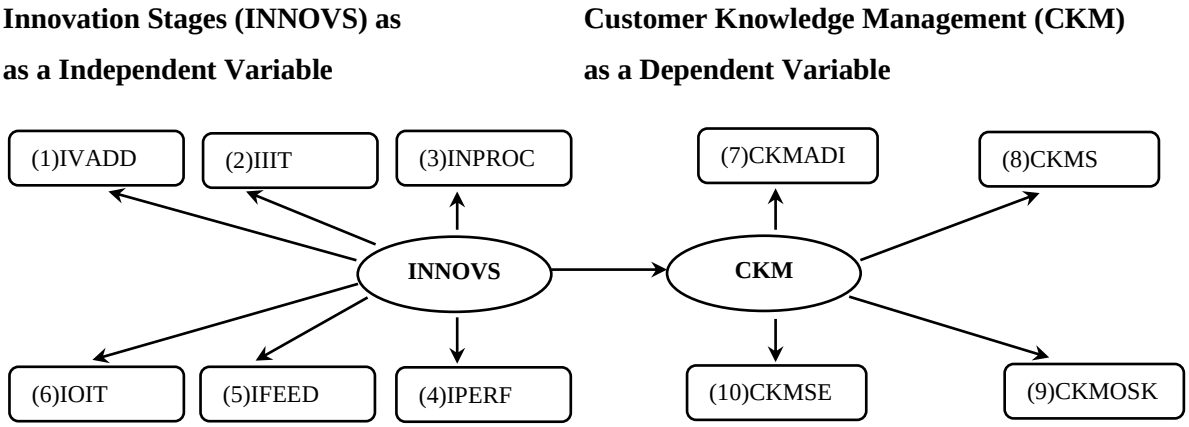
*If We Only Knew What Our Customer Know (***CKM**) as a Customer Experience and Creativity.

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)

As a result of the documentary analysis and making several groups of concepts answering **SQ1**, I obtained the **Figure 1.**

Figure 1

General Conceptual Model



Source: Own

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, and indicators that involves a relationship between *Type of Innovation* (**TOINN**) and *Customer Knowledge Management* (**CKM**). The subjects of the study were 200 CEOs belonging to the Software Developer Sector in Guadalajara City, México.

It was designed a questionnaire with 10 variables, 45 dimensions and 110 indicators based on Likert scale and more than 30 authors about *Innovation Stages* (**INNOVS**) and *Customer Knowledge Management* (**CKM**); to prove the reliability questionnaire, it was used a Cronbach's Alpha test launched in a pilot questionnaire.

After that, the results were analyzed through statistical inference tools, such as the Multiple Regression Analysis with Stepwise Method, contained in the SPSS 20 program; this process is based on inclusion/exclusion of elements and finally, are obtained the most representatives variables and indicators of the conceptual model.

RESULTS

To answer **SQ2,** I present the **Tables: 1, 2 and 3** with the description of 10 variables, 45 dimensions and 110 indicators.

Table 1.- Final Questionnaire showing Innovation Stages and Customer Knowledge Management. Questions: 1-40

INNOVATION STAGES (INNOVS)				
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); Mejía-Trejo,J & Sánchez-Gutiérrez, J.(2013a)
	2).-Cost & Risk (**VACR**)	The Cost is the main constraint to increase the value (**VACR1**)	2	Osterwalder, A & Pygneur, Y. (2010) 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).-Relation&Segments (**VAR&S**)	The Innovation actions consider the customer relationship & segments	5	
	5).-Channels& Cost Revenues (**VACH&C**)	The innovation actions identify channels & cost revenues	6	
	6).-Activities&Resources (**VAA&R**)	The innovation actions consider the key activities & resources	7	
	7).-Partners&Cost Structure (**VAP&C**)	The innovation actions consider partnership & cost structure	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 Innovation (Tangibles, **FFI**)	Provides the most sophisticated equipment to support innovation (**FFI1**)	15	Shipp (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 (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 (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	OECD (2005); 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	Rogers (1984); Afuah (1997)
		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); (Dussauge & Ramantsoa, (1992)
		Makes to investigate the term of a technology (**MR8**)	40	

Source: Authors by own adaptation

Notes: For lacking space, see abbreviations at final of **Table 3**

Table 2.- Final Questionnaire showing Innovation Stages and Customer Knowledge Management. Questions: 41-77

INNOVATION STAGES				
V	**DIMENSION**	**INDICATOR**	**Q**	**AUTHOR**
	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)	**49**	
		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 (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 versus the marginal profits	67	Lev(2001);Shipp (2008); Nicolai (et al., 2011)
	30).-Product & Process (**IFPP**)	Based on the results identifies the stages of new or improved process for upgrading versus the marginal profits (**IFPP1**)	68	OECD (2005); Chesbrough (2006)
		Based on the results identifies attributes of new or improved product / service for its improvement versus the marginal profits (**IFPP2**)	69	
	31).-Innovation (**IFINN**)	Based on the results identifies the stages of new or improved form of marketing for its improvement versus the marginal profits (**IFINN1**)	70	
		Based on the results identifies the stages of new or improved technology for its improvement versus the marginal profits (**IFINN2**)	71	
		Identifies the stages of the new or improved structure and functions of the organization for its improvement versus the marginal profits (**IFINN3**)	72	
		Identifies the type of innovation (radical or incremental) that has given best results versus the marginal profits (**IFINN4**)	73	
	32).-Value Aded (**IFV**)	Based on the results identifies the new or improved value proposition (benefits /	74	Bonel (et al.,2003);

		costs) for its completion; relation value-price versus the marginal profits		Osterwalder & Pygneur, 2010; Gale & Chapman, 1994)
	33).-Leadership and Innovation (**FLINNO**)	The type of leadership that drives innovation is Transactional (**FLINNO1**)	75	Mejía-Trejo (et al., 2013b), 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	

Source: Authors by own adaptation

Notes: For lacking space, see abbreviations at final of **Table 3**

Table 3.- Final Questionnaire showing Innovation Stages and Customer Knowledge Management. Questions: 78-110

CUSTOMER KNOWLEDGE MANAGEMENT (CKM)				
V	**DIMENSION**	**INDICATOR**	**Q**	**AUTHOR**
(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 & Probst,2002
	35).-Information about the Customer (**IABC**)	Strategy of close collaboration with customers. Communities of creation.	79	Nambisan (2002); Gibbert & Probst,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 & Probst,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 (2013a)
(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 (**PER**)	Performance against budget; Customer retention rate.(KM) (**PER1**)	8	
		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; **(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

Applying the statistical inference tools from SPSS 20 program, I obtained:

0.-Normality Test

Results about *Customer Knowledge Management* (**CKM**) are compared with *Type of Innovation* (**TOINN**) to determine the normality of the samples, as is shown in **Table 4**

Table 4.- Kolmogorv-Smirnov Normality Test

	Normality Test			
	Kolmogorov–Smirnov(a) Test			
	TOINN	Value	Df	Sig.
CKM	Primary	.407	14	**.000**
	Secondary	.415	37	**.000**
	Middle	.413	80	**.000**
	Superior	.460	69	**.000**

(a) Includes the Lilliefors significance correction

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

I.- The pilot questionnaire, to get the reliability on a sample of 20 CEOs of Software Developer Sector in Guadalajara City by Cronbach's Alpha test **=.947** and is showed in **Table 5.**

Table 5.-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 author.

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

II.1.- Table 6 shows the Correlations amongst the variables.

Table 6.- Pearson's Correlation

	CKM	TOINN1	TOINN2	TOINN3	TOINN4	TOINN5	TOINN6	TOINN7
CKM	1.000	.501	.560	.508	**.674**	**.634**	**.654**	.484
TOINN1	.501	1.000	.693	.583	.710	.615	.548	.500
TOINN2	.560	.693	1.000	.489	.717	.757	.682	.527
TOINN3	.508	.583	.489	1.000	.663	.605	.503	.631
TOINN4	**.674**	.710	.717	.663	1.000	.832	.802	.665
TOINN5	**.634**	.615	.757	.605	.832	1.000	.788	.594
TOINN6	**.654**	.548	.682	.503	.802	.788	1.000	.609
TOINN7	.484	.500	.527	.631	.665	.594	.609	1.000

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

II.2.- Table 7 shows the set of variables entered/removed (a).

Table 7.- Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method Stepwise
1	TOINN4		Criteria: Probability of- F-to-enter<= .050, Probability of- F-to-remove >=.100
2	TOINN6		

(a) Dependent Variable: CKM

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

II.3.- Table 8 shows the Model Summary

Table 8.- Model Summary

Model	R	R Square	Adjusted R Square	Std. Error for estimate
1	.674 (a)	**.454**	.451	.475
2	.700 (b)	**.490**	.485	.460

(a) Predictors: (Constant), TOINN4;

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

Source: SPSS 20 as a result of the research.

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

III.1.- **Table 9** shows the Analysis of Variance (ANOVA)**.**

Table 9.-ANOVA (a)

Model	**Value**	**Sum of Squares**	**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.

III.2.- **Table 10** shows the results of Coefficients.

Table 10

Coefficients by Stepwise Method (a)

Model	Factor	Unstandardized Coefficients		Standardized Coefficients	t.	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.073	.138		15.057	**.000**
	TOINN4	.430	.033	.674	12.829	**.000**
2	(Constant)	1.930	.139		13.925	**.000**
	TOINN4	.266	.054	.417	4.897	**.000**
	TOINN6	.201	.053	.320	3.755	**.000**

(a) Dependent Variable: CKM

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

IV.- Table 11 shows the Excluded Variables.

Table 11.- Excluded Variables (a)

Model	Variable	Beta in	T	Sig.	Partial Correlation	Collineartity Tolerance
1	TOINN1	.045(b)	.596	.552	.042	.495
	TOINN2	.159(b)	2.124	.035	.150	.485
	TOINN3	.109(b)	1.564	.119	.111	.560
	TOINN5	.237(b)	2.531	.012	.177	.307
	TOINN6	.320(b)	3.755	.000	.258	.356
	TOINN7	.064(b)	.917	.360	.065	.558
2	TOINN1	.059(c)	.809	.420	.058	.494
	TOINN2	.095(c)	1.256	.211	.089	.454
	TOINN3	.126(c)	1.864	.064	.132	.558
	TOINN5	.128(c)	1.302	.194	.093	.266
	TOINN7	.022(c)	.315	.753	.023	.542

(a) Dependent Variable: CKM

(b) Predictors: (Constant),TOINN4

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

Source: SPSS 20 as a result of the research.

DISCUSSION

Table 4. Many statistical procedures are based on two basic assumptions: 1) normality: samples I work with, come from normally distributed populations, and 2) homoscedasticity or homogeneity of variances: all these normal populations have the same variance. Kolmogorv-Smirnov test ponts out that I will reject the hypothesis of normality when the critical level (Sig) is less than the significance level set (usually 0.05). In our case, all items fulfilled the condition. (Hinton, et. al, 2004).

About **Table 5** 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 6, 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 7, 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 Customer Knowledge Management.

Table 8 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 Customer Knowledge Management dependent variable. The R value (**0.674**) in **Model 1** is the multiple correlation coefficient 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 correlation.

Table 9, 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. I 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 8**).

Table 10 shows the Unstandardized Coefficients B column gives us the coefficients of the independent variables in the regression equation for each model trying to predict different scenarios.

Model 1: CKMS = 2.073 + .430 TOINN4 and

Model 2: CKMS = 1.930+ .266 TOINN4+ .201 TOINN6

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 I can compare them.

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 I can see that for **Model 1** the **TOINN4** scores are significant ($p < 0.05$) , and so on with **TOINN4** and **TOINN6** in **Model 2** . Hence, I suggest to use **Model 2** because it

accounts for more of the variance. The Unstandardized Coefficients Std. Error column provides an estimate of the variability of the coefficient.

Table 11 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** I can see that the t value for **TOINN4** is significant ($p < 0.05$). However as I have used the Stepwise method, this variable has been excluded from the model. As **TOINN6** has been included in **Model 2** it has been removed from this table. The Partial Correlation value indicates the contribution that the excluded predictor would make if I 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, here I answered **SQ3** since **Table 7** where is shown the most significant variable: *Innovation Process* (**INPROC**) had the dimension: *Type of Innovation* (**TOINN**) with the most significant *indicators*: *Makes actions to improve or introduce new forms of service* (**TOINN4**), *Innovation activities tend to be rather radical* (**TOINN6).** Therefore, **GH** is explained because using **Table 9, Model 2**, involving **TOINN4** and **TOINN5** produces **49%** variability on the dependent variable *Customer Knowledge Management* (**CKM**).

With all above mentioned, I can see that the Software Developer Sector in Guadalajara México does not take advantage about the *Type of Innovation* (**TOINN**) dimension offers to improve the *Customer Knowledge Management* (**CKM**). If you see **Table 6**, the other indicators are very closely amongst them, but they don´t have enough correlation. So, exists a great chance to the sector for planning and doing direct actions to raise the level of response to *Customer Knowledge Management* (**CKM**). For example, the rest of indicators: *Makes actions to innovate in technology* (**TOINN1**); *Makes actions for innovation in production processes* (**TOINN2**); *Makes actions to improve or introduce new products forms* (**TOINN3**); *Makes actions to improve or introduce new forms of service* (**TOINN4**); *Makes actions to improve or introduce new organizational structures and functions* (**TOINN5**); *Innovation activities tend to be incremental* (**TOINN7**) can be supported by Oslo Manual (OECD, 2005) recommendations integrating the dynamism of the innovation organization (Afuah, 1994).

For future studies and trying to get both: more information about how to improve the Software Development Sector in Guadalajara, México, and a generalized model to implement in other sectors I consider the following works:

An integral study that involves the: **6 variables** (**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**)) **33**

dimensions and 77 indicators from to the *Innovation Stages* (**INNOVS**)) vs. each one of the **4 variables** (**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**)) and their **12 dimensions and 34 indicators** belonging to the *Customer Knowledge Management* (**CKM**). This study might be aimed to discover the underlying or latent indicators, for propose several relationships and hence, actions to raise the level of innovation. The statistical inference method suggested: Structural Equations Modelling that propose a several linear equations and the internal relationships that might be explained by Multiple Regression Analysis.

CONCLUSIONS

I answered general question, (**GQ)**:

GQ: ¿Which is the conceptual model that relates variables, dimensions and indicators from *Type of Innovation* (**TOINN**) into *Innovation Stages* (**INNOVS**) that influence the *Customer Knowledge Management* (**CKM**)? is solved when I answered, the following questions:

1.- About the specific questions (**SQs**):

SQ1: What is the scheme of the model?, solved by mean of the relationships that are shown in **Figure 1.**

SQ2: Which are the variables, dimensions and indicators?, solved by mean of the authors analysis and their works that are shown by the **Tables: 1, 2 and 3.**

In summary:

-*Innovation Stages* (**INNOVS**) model, described with **6 variables**:

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**);

With **33 dimensions and 77 indicators.**

Type of Innovation (**TOINN**) is a **dimension (19) with 7 Indicators (47-53)** inside the variable *Innovation Process* (**B**) (**INPROC**). See **Table 2.**

-*Customer Knowledge Management* (**CKM**), described with **4 variables:**

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**);

With **12 dimensions and 34 indicators.**

SQ3: Which are variables and indicators of *Type of Innovation* (**TOINN**) more significant into the model?, solved applying Multiple Regression Analysis between the dependent variable *Customer Knowledge Customer* (**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**) over *Customer Knowledge Customer* (**CKM**).

2.- Two models that might be explain and predict the behavior of *Customer Knowledge Customer* (**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

3.- About the general hypothesis proposed (**GH):**

GH: The most important indicators of *Type of Innovation* (**TOINN**) produce, **more than the 40%** of the *Customer Knowledge Management* (**CKM**) variability in the Software Development Sector firms in Guadalajara, México. I 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 **GH** is accepted.

Trying to get both: more useful information from the Software Developer Sector in Guadalajara México and a generalized model able to predict and explain the relationship between *Innovation Stages* (**INNOVS**) and *Customer Knowledge Management* (**CKM**), I proposed an integral study, where are related all the **110 indicators**, from both: *Innovation Stages* (**INNOVS**) and *Customer Knowledge Management* (**CKM**), through the use of Structural Equations Modelling. The aim, 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.

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