

# Technology, Innovation, Finance and CRM: Repercussions on Competitiveness

JOSÉ SÁNCHEZ GUTIÉRREZ  
TANIA ELENA GONZÁLEZ ALVARADO

*Coordinators*

UNIVERSIDAD DE GUADALAJARA

RED INTERNACIONAL DE INVESTIGADORES EN COMPETITIVIDAD

Technology Innovation,  
Finance and CRM: Repercussions  
on Competitiveness



# Technology Innovation, Finance and CRM: Repercussions on Competitiveness

JOSÉ SÁNCHEZ GUTIÉRREZ  
TANIA ELENA GONZÁLEZ ALVARADO  
(Coordinators)



Technology Innovation, Finance and CRM: Repercussions on  
Competitiveness  
Universidad de Guadalajara

Sánchez-Gutiérrez, José; González-Alvarado, Tania Elena (coordinators)

This work is a product of the members of RIICO (Red Internacional de Investigadores en Competitividad) with external contributions. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of Universidad de Guadalajara and RIICO.

All the photos on this book were taken from Unsplash. Unsplash is a photo discovery platform for free to use, high-definition photos. Unsplash, Inc., a Canadian corporation) operates the Unsplash website at [unsplash.com](https://unsplash.com) (the “Site”) and all related websites, software, mobile apps, and other services that they provide (together, the “Service”) with the goal of celebrating and enabling contributors and fostering creativity in their community.

Primera edición, 2017

© D.R. 2017, Los autores

© D.R. 2017, Red Internacional de Investigadores en Competitividad

© D.R. 2017, Fondo Editorial Universitario

© D.R. 2017, Universidad de Guadalajara  
Centro Universitario de Ciencias Económico Administrativas  
Av. Periférico Norte 799, Edificio G-306  
Núcleo Los Belenes  
45100 Zapopan, Jalisco, México

**ISBN 978-84-17075-56-9**

Impreso y hecho en México  
*Printed and made in Mexico*

# Contents

<b>Prologue.....</b>	<b>7</b>
<b>Chapter 1.....</b>	<b>9</b>
Influence of Personality and Emotional Intelligence on the Negotiation Style An Empirical Study in Mexico	
Celestino Robles-Estrada Diana Isabel de la Torre-Enríquez Sonia Andrea Díaz-Madrado	
<b>Chapter 2.....</b>	<b>33</b>
Adaptation and Anticipation to the Future by the Small and Medium Enterprises at the Metropolitan Zone of Guadalajara	
Luis Alberto Bellon-Álvarez Francisco Javier López-Cerpa Martha Filomena Muñoz-Fajardo Juan Antonio Vargas-Barraza	
<b>Chapter 3.....</b>	<b>55</b>
Impact of Cronyism in Mexican Multinationals	
Jorge Pelayo-Maciél Manuel Alfredo Ortiz-Barrera Tania Elena González-Alvarado	
<b>Chapter 4.....</b>	<b>75</b>
Financial Cost of the Public University Pension Plan	
Denise Gómez-Hernández Ignacio Almaraz-Rodríguez	
<b>Chapter 5.....</b>	<b>93</b>
CRM as a Fostering Tool for Competitiveness Plastic Manufacturing SMEs in the ZMG	
José Sánchez-Gutiérrez Tania-Elena González-Alvarado Oscar Alejandro Espinoza-Mercado	
<b>Chapter 6.....</b>	<b>113</b>
Digitalization bringing Innovation to the Chemical Industry	
Supriyo Das Ignasi Brunet-Icart Carlos Alberto Santamaria-Velasco	
<b>Chapter 7.....</b>	<b>137</b>
Innovation of Sustainable Products and Services through Ecodesign Project Management by applying SINNAPS	
Lucio Guzmán-Mares Ma. Soledad Castellanos-Villarruel David Fernández-de la Puente Salvador F. Capuz-Rizo	



# Prologue

Technology Innovation, Finance, and CRM, their repercussions on Competitiveness is an excellent book for experts, students and entrepreneurs. Into their pages, we can discover different topics about the competitiveness factors like CRM, Marketing, Social Network, Innovation and Technology, CSR, and so on.

In seven chapters, academics and experts explain the situation of the organization. Every part of this book was based on empiric and real evidence from enterprises, universities, governments and institutions. All of these studied organizations are part of the competitive environment that involve the market. The writers believe in the economic progress across of the innovation, the entrepreneurship, the social responsibility and the international cooperation between regions, countries and corporations.

The authors are from Mexico and Spain. Everyone is an expert in economic and business Sciences. The universities that participate in this project are: Universidad de Guadalajara, Universitat Rovira I Virgili, Universitat Politècnica de València and Universidad Autónoma de Querétaro.

This publication was created under the best practices of scientific edition. The editorial team analyzed carefully the quality and originality of the contents. Every chapter was selected, evaluated, and modified with the support of international peers.

We hope that this book contributes for Publishers, researchers and academics to the advancement of theoretical and practical knowledge.

José Sánchez Gutiérrez





---

# Chapter 1

---



## Influence of Personality and Emotional Intelligence on the Negotiation Style

### An Empirical Study in Mexico

*By Celestino Robles-Estrada; Diana Isabel de la Torre-Enríquez  
and Sonia Andrea Díaz-Madrado*



# Influence of Personality and Emotional Intelligence on the Negotiation Style. An Empirical Study in Mexico

Celestino Robles-Estrada  
Diana Isabel de la Torre-Enríquez  
Sonia Andrea Díaz-Madrado  
Universidad de Guadalajara, México

## INTRODUCTION

One recurring theme in negotiation research deals with the predictive power of personality traits in the negotiation process. Less recurring them in this area is the link between emotional intelligence and its influence in the negotiating process. Several researchers have theorized that individual personality characteristics influence how bargainers behave (i.e., Barry and Friedman, 1998). The rationale for the widespread interest in this relationship is perhaps best summarized by Rubin and Brown (1975): "As bargainers enter into relationships with one another, they bring with them variations in prior experience, background, and outlook that may affect the manner and effectiveness with which they interact" (p. 157). Unfortunately, this stream of research has generated inconsistent support for the personality and negotiation relationship (i.e., Barry & Friedman, 1998; Wall & Blum, 1991; Greenhalgh, Neslin, & Wilkey, 1985; Rubin & Brown, 1975 and Mintu-Womsatt, 2002). Indeed, after an extensive review of the existing literature, Wall and Blum (1991) noted the lack of significant support for any personality trait, perhaps one reasonable explanation for the inconsistencies in the personality-negotiation research stream can be attributed to the influence of EI on the negotiation process, nevertheless fewer researchers have theorized and researched how emotional intelligence influence (EI) negotiation style, (i.e., Foo, et al., 2005), who examine the effects of EI on the results of negotiations that take into account the reciprocal social influence inherent in a



negotiation. Even more, we found no one research linking both, personality trait and EI to negotiation style.

This study examines the combined effects of personality traits and emotional intelligence on the negotiation strategy. The personality characteristics examined here include conciliatory predisposition, trusting nature, and risk propensity. Emotional intelligence is measured following the scale proposed by Austina, Saklofske, Huang, and McKenney (2004). The article consists of four major sections besides this introduction. The section that follows provides the theoretical foundation for hypotheses making. The second section discusses the method used. The results of the statistical analyses are then presented, followed by a discussion of the findings as well as the limitations and directions for future research. The article concludes with managerial implications and conclusions.



## 1. THEORETICAL FRAMEWORK AND HYPOTHESIS.

### 1.1 Negotiation.

Negotiation is a concept that has accompanied human beings from antiquity to the present day, all this time humans have developed new experiential customs, where the rules were those that define the way of life and relationships; all this with the modern scientific development cause the human being is not able to live without negotiating (Mometolo, 2012). Negotiation is the process where individuals "attempt to settle what each shall give and take or perform and receive in a transaction" (Thompson, 1990, p. 516). Negotiations trading mostly create agreements where both sides win (Chamoun, 2016). Negotiation is a series of actions in which two or more parties interact with different interests, aiming to reach an agreement through reciprocity (Carnevale and Pruitt, 1992; Putnam and Jones, 1982; Rubin and Brown, 1975 and Zhi and Yu, 2004) especially, when there is the potential for higher profit and negotiators can create even more value (Pruitt, 1981; Zhi and Yu, 2004), It is all this that negotiation is considered a means of transport, communication and stakeholder management (Alfredson and Cungu, 2008).

### 1.1.1 Negotiation styles.

Negotiation techniques are varied, different professionals and institutions have different views about it, but there is a classification in particular, which describes Barba (2011) as the most common in the negotiations: 1) Win - Lose: When one of those involved in negotiating only seeks profit regardless of the outcome of the counterpart, is not only the fact of winning, but to injure, as an example, can be seen in unfair competition, 2) Lose - lose: In this negative feelings like anger and ego involved, the goal of everyone involved is what the counterpart loses regardless if he loses, Beard (2011) mentions as an example, the existence of divorce cases where properties sold prices well below their real value, not wanting to let the other person, 3) Lose - Win: This type of negotiation seeks the counterpart is benefitted regardless of losing in the negotiations; an example is when a company seeks long-term benefit of another, whether at the time lost in the negotiations, and 4) Win - Win: This type of trading is where the best solution is achieved, those involved in this case are committed from the beginning to reach this type of solution, where they seek the option where they can find common ground, to enable synergies and reach other agreements in the future. This latter type of negotiation (Win - Win) should be the only solution to any negotiation, unfortunately for various problems, problems of all kinds, do not allow this type of bargaining is predominant in the negotiations (Beard, 2011). Mometolo (2012) classifies trading into four types (Table 1)

Table 1. Negotiation types

1. Accommodative negotiation	It is one in which the negotiator loses negotiation, because it loses interest, perhaps what motivated him at first.
2. Competitive negotiation	It is one in which the negotiator, is an aggressive character, with the ultimate goal of winning the negotiation
3. Collaborative negotiation	It is the type of negotiation in which the profit is distributed to both parties, although not equally but close; in this type of negotiation is the medium and long term, and sought not to damage the relationship.
4. Avoidant negotiation	Many authors do not classify this type of negotiation because it really does not happen. It is to know and analyze the possible negotiation and know when to fold or avoid it.

### 1.1.2. The problem-solving communication.

The problem-solving communication is critical in integrative bargaining (Goering, 1997). This approach is essentially characterized by behaviors that are cooperative —focusing on the needs of negotiation parties through the exchange of relevant information (Perdue & Summers, 1991; Barry & Friedman, 1998). The problem-solving approach embodies ideas such as the negotiator's willingness to make concessions, or adapting these concessions to the requirements of both parties (Westbrook, 1996; Graham et al., 1994). This is accomplished by seeking information about the counterpart's needs and preferences. Once these have been discussed and clarified, negotiators make trade-offs so that each party can receive his/her preferred outcome (Pruitt, 1981; Perdue & Summers, 1991).

For the purposes of this study, the negotiation style stressed here is the problem-solving approach. This style was chosen because adopting the problem-solving approach seems logical, since successful trade negotiations require conflict resolution and maintaining business relationships (Graham et al., 1994).

### 1.2 Emotional intelligence.

According to Marina (1993) and Molero, Martinez and Saiz, (1998) Intelligence is the ability to raise, manage and control the mental operations, it is characterized by creating and managing unreality and last and from a functional point of view, is a way to adapt to the environment. Intelligence is a basic skill that influences the performance of all kinds cognitive tasks, therefore considered an intelligent person does a good job to solve problems, explain and propose riddles (Ariola and Pérez, 1999). Gardner (1983) defined the existence of various types of intelligence mentioning that these can be grouped into eight types multiple intelligences which are linguistic, musical, logical-mathematical, bodily - kinesthetic, spatial, intrapersonal, interpersonal and naturalist. Although the Gardner theory of the multiple intelligences (MI) has been widely criticized by the scientific psychology by his lack of evidences, and because it is a theory that depends on subjective judgment (i.e., Scarr, 1985 and Waterhouse, 2006), there are also defenders of MI theory argue that the traditional definition of intelligence is too narrow, and thus a broader definition more accurately reflects the differing ways in which humans think and learn (Nikolova, and Taneva-Shopova, 2007). Macías, (2002) includes the types of intelligence of Gardner's theory (1995) but

also affirms that every human has its own intelligence profile, that is, is more competent in some disciplines and less in others. Similarly Marie, (2013) and Armstrong, (2006) mentions the description of each of the Gardner's intelligence types and they agree that any activity based on intelligence has its own path of development. Two of the Gardner Intelligence Types perform special importance in this study as they have been related to EI: 1) Intrapersonal intelligence, as refers to the ability of people to know their inner world, that is, their own and most intimate emotions and feelings as well as their own strengths and weaknesses, (Armstrong, 2006) and 2) Interpersonal intelligence, the ability to recognize emotions and feelings arising in relations between people and groups, (Macías, 2002).

Emotional intelligence is defined as is the ability to understand emotions and feelings in oneself and others and to use this understanding as a way to direct actions. (Salovey and Mayer, 1990; Aldosiry, Alkhadher, Aiaqraae and Anderson, 2016). It consists of three abilities or skills: 1) appraisal and expression of emotions, 2) regulation of emotions, and 3) utilization of emotions (Aldosiry, Alkhadher, Aiaqraae and Anderson, 2016). Sternberg, (2000) defined emotional intelligence as non-cognitive abilities, knowledge, and merits that enable one to adapt successfully to different life situations. Bar (1997), established five fields of merits that can represent emotional intelligence capacities: 1) Intra-personal skills, including emotional self-awareness, self expression, self-management, self-development, and independence, 2) inter-personal skills that includes relationships among people, responsibility, social commitment, and unity, 3) adaptability: ability to solve problem, to be realistic, and to test reality and flexibility, 4) Stress management: ability to stand stress and impulses, and 4) general mood: including optimism and happiness. According to Mayer, Salovey and Caruso, (2004), and Magnano, Craparo and Paolillo, (2016) emotional intelligence refers to the ability to accurately perceive access and generate emotions, assist thought processes, and reflectively regulate emotions so as to promote emotional and intellectual growth. Emotional intelligence allow us to become aware of our emotions, understanding the feelings of others, tolerate the pressures and frustrations we endure at work, emphasize our ability to work together, adopt an empathetic and social attitude that we will provide greater opportunities for personal development, engage, discuss and live with everyone from a harmonious environment and peace



(Goleman, 1996). The most important emotional competencies for success are the following three groups: 1) Initiative, achievement motivation and adaptability; 2) Influence, ability to lead teams and political awareness; and 3) Empathy, self-confidence and ability to encourage the development of others (Goleman, 1996). Emotional intelligence is important when it comes to issues related to the bargaining process Foo, Elfenbein, Tan and Aik, 2005). Barry and Friedman, (1998) have emphasized the range of cognitive skills, intrapersonal and interpersonal skills that are necessary to pass the difficult process inherent in complex negotiations.

#### 1.2.1. Emotional intelligence and negotiation style.

Negotiation is a valuable context in which to explore the consequences of emotions, because negotiations can at times be infused with emotion (Kumar, 1997) and these emotions can shape how we feel about the negotiation and objective outcomes such as the concessions an individual is prepared to make (Baron, 1990). It has been identified that there is a relationship between the negotiating capacity of an individual and their level of emotional intelligence because the negotiation is a complex set of decisions that make a task, with a range of action alternatives sources, cognitive skills prominent factor in information processing approaches (Bazerman and Carroll 1987; Bottom and Anger, 2013). Negotiators with greater cognitive intelligence, generate more logical psychosocial outcomes such as satisfaction, taste and intentions of working again with the other party in the future, so it is likely to prove a considerable economic value in the long this term through investment in relational capital as (Sharme, et al., 2013) citing Gelfand, Major, Raver, Nishi and O'Brien (2006). If so, then emotional intelligence may even be a better predictor of efficacy of cognitive ability negotiator. There are studies that prove the relationship of emotional intelligence with the negotiating capacity; for example cultural intelligence (CQ), defined as the ability of a person to the successful adaptation to new cultural configurations, that is to say, for attributable unfamiliar environments to cultural context according Earley, Ang, and Tan, (2006) cited by Groves, Feyerherm and Gu, (2014). Therefore the motivation associated with cultural intelligence, can affect the effectiveness of trading strategies, including manipulative, cooperative and interesting behaviors to resolve intercultural conflicts (Groves, Feyerherm and Gu, 2014). Another study mentions that emotions function as social communication, negotiators

transmitting information on their own feeling about the situation (Keltner and Haidt, 1999; Van and Van, 2008). In this way emotions influence not only the behavior of those who experience, but also on the behavior of those who perceive them. In this study it was found that expressions of disappointment could exercise significant influence in the negotiation, since any process to results, (Van and Van, 2008). Moreover, according to Forgas (1995) and cited by Nazir and Nam (2006), some studies have shown that the type of mood influences how people interpret problems when they face them, such as selection of a partner, assigning rewards, plan a meeting or negotiation; therefore the states of positive and negative moods have significant effects on the thoughts of individuals and how they perceive and interpret negotiators negotiation problem. The study by Nazir and Nam, (2006) shows that cognitive assessment of the situation shapes the behavior of trading, influencing this, emotions negotiator and social reasons. In other words test how an emotion is caused and how it influences behavior in a negotiation situation. Foo, et al., (2005) examine the effects of emotional intelligence (EI) on the results of the negotiations that take into account the social influence reciprocal inherent in a negotiation, emotional intelligence of both forms was examined, objective and subjective and the results of the negotiation; it was found that many of the skills related to emotional intelligence, help negotiators in creating joint value could also help in negotiating the creation of individual value claiming for themselves.

### 1.3 Personality variables.

The study of personality is based on the essential insight that all people are similar in some ways, yet different in others (Phares and Chaplin, 1997). In psychology, trait theory (also called dispositional theory) is an approach to the study of human personality. Trait theorists are primarily interested in the measurement of traits, which can be defined as habitual patterns of behavior, thought, and emotion (Kassin, 2003). According to this perspective, traits are relatively stable over time, differ across individuals (e.g. some people are outgoing whereas others are shy), and influence behavior. The Big Five personality trait, also known as the five factor model (FFM), is a model based on common language descriptors of personality (lexical hypothesis) (Goldberg, 1993; Costa, and McCrae, 1992). The FFM is most widespread and generally accepted model of Personality (Goldberg, 1993), it was shown to subsume most known personality traits, and it is claimed to represent the basic structure

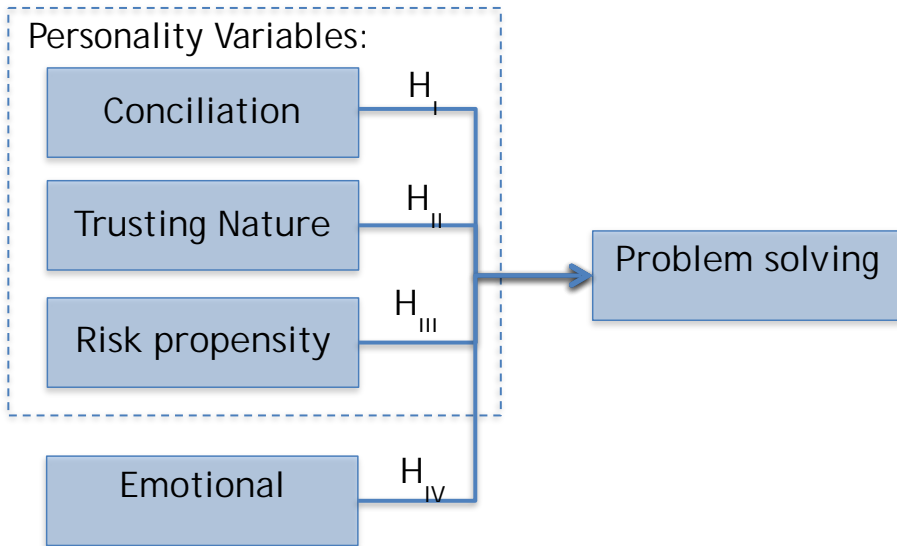
underlying the variations in human behavior and preferences, providing a nomenclature and a conceptual framework that unifies much of the research findings in the psychology of individual differences. FFM includes the following traits: a) Openness, b) Conscientiousness, c) Extroversion, d) Agreeableness, and e) Emotional stability (opposite referred to as neuroticism).

There is an abundance of studies in the negotiation literature focusing on the fundamental assumption that person parameters or bargainer characteristics are relevant to negotiation processes and outcomes (i.e., Barry & Friedman, 1998). While suggestions regarding the influence of bargainer characteristics on negotiations are intuitively appealing, many studies have provided inconsistent support for such relationships (Wall & Blum, 1991). Nevertheless, King and Hinson (1994) contended that these inconsistencies are partly due to the utilization of bargainer variables that are not conceptually related to negotiations. In other words, personality traits that appear to have no bearing on the bargaining activity are often investigated for research purposes. Barry and Friedman's (1998) seminal article on personality variables and negotiation has been cited often in the contemporary literature. Their study is based on the Five-Factor Model of Personality (a.k.a, Big Five, FFM). While the Big Five has received much attention, the current research study uses an alternative means of evaluating the personality. An adaptation of Shure and Meeker's (1967) and Harnett and Cummings's (1980) personality factors is utilized in this study. The Personality-Attitude Schedule (PAS) by Shure and Meeker was developed "in response to the need to find and synthesize a number of existing attitude and personality scales that would prove predictive of behavior in bargaining settings" (Harnett & Cummings, 1980, p. 89). While the PAS was developed specifically for the bargaining context, the overlap in the theoretical underpinnings of the three personality traits discussed here and the FFM is still evident.

## 2. MEASUREMENT MODEL.

In this study, the measurement model consists of four independent factors (conciliation, trusting nature, risk propensity and emotional intelligence), intended to explain the dependent variable: Problem solving approach, see Figure 1.

Figure 1. Proposed model



## 2.1 Effect of personality variables.

**Conciliatory Versus Belligerent Predisposition.** This variable relates to diplomatic and humanistic responses guided by humanitarian as well as cooperative considerations (Shure & Meeker, 1967). Conciliatory negotiators use constructive dialogues to attain mutually beneficial outcomes. They are more apt to communicate and cooperate with their counterparts. They are also more inclined to adjust their negotiation strategies as a result of their communication with each other (Westbrook, 1996). That is, their integrative communication/messages elicit integrative responses (Goering, 1997)—the essence of the problem-solving approach. Indeed, Harnett and Cummings (1980) found that negotiators who score high in conciliation were more oriented toward problem solving.

**Hypothesis I:** A positive relationship exists between negotiators' conciliatory predisposition and the problem-solving approach.

**Risk-Taking Propensity.** Negotiators' risk propensity relates to their tendency to expose themselves to unnecessary dangers (Shure & Meeker, 1967). The findings of Harnett, Cummings, & Hughes, (1968) indicated

that those with high-risk propensity were more inclined to make fewer concessions during negotiations, while Bottom and Studt (1993) found that negotiators with lower risk propensity (i.e., risk avoidance) were more likely to cooperate. These negotiators cooperate to reach better agreements (Bottom & Studt, 1993). Those who are willing to take more risks use aggressive techniques that are self-oriented, rather than mutually beneficial, and are willing to take their chances with regard to the outcome of the negotiation activity (Westbrook, 1996).

Hypothesis II: A positive relationship exists between negotiators' trusting nature and the problem solving approach.

Trusting Versus Suspicious Nature. This variable relates to how negotiators expect their partners to respond (Fells, 1983). It is based on the belief that the other party is also ready to undertake cooperative actions (Pruitt, 1981). Negotiators who are inherently suspicious tend to behave more competitively during the negotiation, while trusting negotiators are more likely to share and/or exchange information (Butler, 1995). Trusting negotiators feel confident that their partners will not use shared information to take advantage of the situation (Butler, 1995).

Hypothesis III: A negative relationship exists between negotiators' risk propensity and the problem-solving approach.

Emotional intelligence. Butt and Choi (2006) have studied negotiator emotions and negotiation outcomes. They identified four emotions: pride-achievement, gratitude, guilt-shame and anger present in any negotiator, as influencing variables in the outcome of a negotiation. The ability of high EI individuals to understand the emotions of others can help contribute to the awareness of whether the negotiation partner is satisfied with the options created and whether the interests of the other side are met. Understanding the subtle communication cues, and the maintenance of composure and a positive problem-solving attitude during an often-difficult process, are factors that benefit the creation of joint objective value (Hegtvedt & Killian, 1999; Naquin & Paulson, 2003). Another component of EI that of regulating ones' emotions also facilitates the negotiation process. This dimension of EI enables negotiators to remain focused on their joint interests, and retain their perspective even if emotions run high. Emotions can lead to an impasse during the negotiation process (Colon & Hunt, 2002). Anger, for example, can hinder objectivity, can cause a loss of trust in the other party, and can lead to actions of retaliation instead of actions towards reaching an agreement

(Adler et al., 1998). In contrast, positive actions taken by one side can lead to reciprocity by the other and thereby establish norms for reciprocity (Thompson et al., 1996). Just as emotional intelligence has been linked to higher life satisfaction (Palmer, Donaldson, & Stough, 2002), through regulating their own emotions effectively, negotiators are likely both to meet their objective interests as well as to develop good relationships with the negotiating partner (Baron, 1990; Hegtredt, & Killian, 1999). Taken together, these facts provide support for the hypothesis that

Hypothesis IV: An individual's EI level is positively related with the problem-solving approach

## 2.2. Operationalization of variables.

**Problem-Solving Approach.** The measures of Graham et al. (1994) were used to assess negotiators' self-reported level of problem solving orientation. Negotiators' use of the problem-solving approach was measured using a four items, 5-point semantic differential scale with opposing adjectives as anchors.

**Personality Variables.** Measures for trusting nature, conciliation, and risk aversion were adapted from Shure and Meeker (1967) and Harnett and Cummings (1980). Both trusting nature and conciliation consisted of five 5-point Likert-type items with "strongly agree" and "strongly disagree" as anchors. The risk-aversion variable was a three-item, 3-point scale with "yes" and "no" as anchors, in addition to "cannot decide" as a midpoint.

**Emotional Intelligence.** The measure utilized in this study was Austin, Saklofske, Huang and McKenney (2004), modified version of Schutte et al.'s (1998) measure, which in turn developed their measure of emotional intelligence based on the model of emotional intelligence developed by Salovey and Mayer (Salovey, Mayer, 1990). Even though Gardner (1983) did not use the term emotional intelligence, his concepts of intrapersonal and interpersonal intelligences provided a foundation for later models of emotional intelligence. The core of intrapersonal intelligence is the ability to know one's own emotions, while the core of interpersonal intelligence is the ability to understand other individuals' emotions and intentions. Salovey and Mayer (1990) who first used the term "emotional intelligence", postulated that emotional intelligence consists of the following three categories of adaptive abilities: appraisal and expression of emotion, regulation of emotion and utilization of emotions in solving problems. The original scale was a self report measure of emotional



Table 3. Measurement instrument. Independent variables

Constructs	Measurement Variables
Conciliation	<ol style="list-style-type: none"> <li>1. When you quarrel with someone, you should make a special effort to understand his/her point of view</li> <li>2. In quarrels with other people, we should make it a point of admitting when we are wrong</li> <li>3. Most activities are fun when you combine your own abilities with other people's.</li> <li>4. You should not be modest if it leads people to underestimate your abilities.</li> <li>5. When people are uncooperative, the most effective way to get them to do what you want is to use threats.</li> </ol>
Trusting Nature	<ol style="list-style-type: none"> <li>1. Most people are not always straightforward and honest when their own interests are involved.</li> <li>2. We should always feel responsible for helping others less fortunate than ourselves.</li> <li>3. Even nations that appear friendly to us may be unreliable, because they are mainly concerned with their own interests</li> <li>4. Even people who appear friendly may be unreliable, because they are mainly concerned with their own interests.</li> <li>5. There are some people who cannot be trusted at all.</li> </ol>
Risk Propensity	<ol style="list-style-type: none"> <li>1. Do you drive a car rather fast?</li> <li>2. Would you like to take a chance by accepting a job you know nothing about?</li> <li>3. Do you like to drive a car rather fast when there is not a speed limit?</li> </ol>
Emotional intelligence	<ol style="list-style-type: none"> <li>1. I know when to speak about my personal problems to others.</li> <li>2. My mood has little effect on how I deal with problems</li> <li>3. I am aware of my emotions as I experience them</li> <li>4. I prefer to keep my emotions private</li> <li>5. I am aware of the non-verbal message that I send others.</li> <li>6. I compliment others when they have done something well.</li> </ol>

The respondents were 503 Mexican undergraduate university students, of whom 210 were male and 293 were female. The mean age of the group was 21.12 years, standard deviation 1.297 years.

#### 2.4 Data analysis and results.

To assess HI to HIV, a Structural Equation Model (SEM) was utilized. Our analyses followed Anderson and Gerbing's (1988) two-step approach whereby the estimation of a confirmatory measurement model precedes the simultaneous estimation of the structural models, as described next.

#### 2.5. The measurement model.



Confirmatory factor analysis was performed using EQS 6.2 to confirm the variables measuring the constructs in the model. Reliability of the measurement model was examined by calculating Cronbach's alpha coefficient for each of the constructs separately. We also report the composite reliability of the constructs because it is generally acknowledged that composite reliability is a better measure of scale reliability than Cronbach's alpha coefficient (Bagozzi & Yi, 1988; Homburg, Giering, & Menon, 2003). Table 4 shows that the alpha coefficient value for all the constructs is greater than 0.7 which is considered to be acceptable for the constructs to be reliable (Hair, Black, Babin, Anderson, & Tatham, 2006). The composite reliability values of all the constructs are greater than 0.6 that further strengthens our assessment of reliability of the constructs. The measurement model indicates an adequate model fit of the data (Bagozzi & Yi, 1988, Bearden, Sharma & Teel, 1982, Bentler, 1990). ( $\chi^2 = 920.96$ ,  $df = 217$ ,  $NFI = 0.887$ ;  $NNFI = 0.928$ ;  $CFI = 0.837$ ;  $MFI = 0.91$  and  $RMSEA = 0.031$ ).

Table 4. Reliability and convergent validity.

Constructs	Measurement items	Loadings	Cronbach's alpha	Composite reliability	AVE
Conciliation	Co1	0.797	0.882	0.927	0.598
	Co2	0.840			
	Co3	0.816			
	Co4	0.782			
	Co5	0.611			
Trusting Nature	TN1	0.821	0.981	0.962	0.736
	TN2	0.838			
	TN3	0.858			
	TN4	0.864			
	TN5	0.907			
Risk Propensity	RP1	0.627	0.905	0.908	0.664
	RP2	0.826			
	RP3	0.958			
Emotional intelligence	EI1	0.832	0.981	0.941	0.640
	EI2	0.737			
	EI3	0.627			
	EI4	0.876			
	EI5	0.782			
	EI6	0.797			
Problem-Solving Approach	PS1	0.657	0.865	0.883	0.502
	PS2	0.757			
	PS3	0.793			
	PS4	0.641			
	PS5	0.681			

### 2.5.1. Convergent validity.

Convergent validity was examined by calculating the average variance extracted (AVE) and the factor loadings of the measurement items on respective constructs in the model (Fornell & Larcker, 1981). Table 4 shows that all the measurement variables had significant loadings onto the respective latent constructs ( $p < 0.05$ ) with values ranging between 0.611 and 0.958. In addition, the AVE for each construct is equal to or greater than 0.50, which further supports the convergent validity of the constructs.

Table 5. Discriminant validity.

	1	2	3	4	5
Problem-Solving					
Approach	0.502	0.250	0.420	0.180	0.200
Conciliation	0.545	0.598	0.430	0.320	0.410
Trusting Nature	0.464	0.367	0.736	0.399	0.420
Risk Propensity	0.440	0.541	0.466	0.664	0.228
Emotional intelligence	0.290	0.530	0.262	0.171	0.640

Note: The upper triangle has the values of squared inter-construct correlations and the lower triangle has the interconstruct correlations values; the diagonal elements are the AVE values (bold).

### 2.5.2. Discriminant validity.

Discriminant validity was assessed in two ways. First, as suggested by Fornell and Larcker (1981), it was assessed by comparing the average values of variance extracted for each construct with the corresponding inter-construct squared correlation estimates. Table 5 shows that all the AVE values are greater than the inter-construct squared correlations, which indicate the discriminant validity of the measurement model. Second, to test whether the inter-construct correlation was significantly different from unity, we used the chi-squared difference tests (Bagozzi, Yi, & Phillips, 1991). The chi squared difference test was performed by estimating the measurement model by constraining the inter-construct correlation to unity and then the same model was estimated freely, estimating the inter-construct correlation. The test statistic is the difference between the chi-square values of 14 more degrees of freedom, and all changes in chi-square obtained were significant at  $p < 0.05$  level of significance. This indicated that the constructs in the model are distinct from each other. Overall, we believe that our measurement scales for the constructs are reasonably reliable and valid.

### 2.5.3. The structural model and hypotheses testing.

The proposed hypotheses were tested using structural equation modeling using EQS 6.2. Results indicated that the adequate model fit with the chi-square statistic ( $\chi^2 = 920.96$ ,  $df = 217$ ) is significant and all the baseline comparison indices (NFI = 0.887; NNFI = 0.928; CFI = 0.837; MFI = 0.91 and RMSEA = 0.031) indicated an acceptable fit of the structural model with the data. Table 6 shows the parameter estimates of the structural model. Results show that the path coefficients between Conciliation-Problem-Solving Approach, Trusting Nature-Problem-Solving Approach, and Emotional intelligence-Problem-Solving Approach are positive and significant at  $p < 0.05$  while the path coefficient Risk Propensity-Problem-Solving Approach is negative and significant at  $p < 0.05$  supporting H<sub>I</sub>, H<sub>II</sub>, H<sub>III</sub>, and H<sub>IV</sub>. Hence, the linear relationships in the model were supported.

Table 6. Estimated path coefficients.

Hypothesised paths		Path coefficients	Results
Conciliation	--> Problem-Solving Approach	0.192*	HI (Accepted)
Trusting Nature	--> Problem-Solving Approach	0.106*	HII (Accepted)
Risk Propensity	--> Problem-Solving Approach	-0.155*	HIII (Accepted)
Emotional intelligence	--> Problem-Solving Approach	0.221*	HIV (Accepted)

## 3. DISCUSSION AND IMPLICATIONS

The purpose of this study was twofold: (a) to test the expected relationships among the three personality variables and negotiation style and (b) to test the expected relationship among emotional intelligence and negotiation style. We found significant relationships (paths) among the four factors, emotional intelligence generating the greatest impact while trusting nature showed the least impact. In revisiting the personality, emotional intelligence and negotiation-style relationship, this study contributes an alternative way of exploring how emotional intelligence affects the personality-negotiation relationship. Because the findings suggest that negotiation style is driven by emotional intelligence as well as by one's personality traits, this information is critical in hiring and/or training prospective negotiators. Companies ought to emphasize

providing assistance to their representatives to develop skill sets that enhance the problem-solving approach.

#### 4. STUDY LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

There are some limitations of this research, which needs to be considered while interpreting our research findings. First, these findings need to be qualified with some cautionary notes due to several limitations of the research design: this study was based on quantitative analyses of psychometric measures obtained by a self-reporting questionnaire, which allowed an empirical test of the proposed model based on statistical significance. However, qualitative analyses (e.g., video analysis, content coding of transcript of actual negotiation styles) might have provided a richer understanding of the negotiation process by allowing more contextualized interpretations of interpersonal dynamics based on emotion and personality trait. Future studies may expand these findings using other research designs to reveal underlying interactive dynamics of negotiation. Despite these potential limitations, this study contributes to the negotiation literature by expanding our understanding of the role emotional intelligence and personality characteristics in negotiations and the process-mechanisms related to them.

We believe that a better understanding of the role of emotional intelligence and personality traits in the negotiation process will offer valuable theoretical and practical implications. An important extension of this study would be an investigation of the moderating or mediating role of cultural variables as they affect international negotiations. It also would be fruitful to replicate these findings in real-life situations with participants from different negotiation expertise level, using research design features such as longitudinal data collection and qualitative evaluation of emotion, behavior, and negotiation outcomes.

The present study demonstrated the value of using personality traits as well as emotional intelligence as a lens for examining individual differences in negotiation outcomes. A benefit of EI is its relevance to workplace outcomes (Law, Wong and Song, 2004; Wong, Law and Wong, 2004). However, because emotional intelligence has continued to be controversial in the literature (e.g., Becker, 2003; Jordan, Ashkanasy, & Härtel, 2003; Roberts et al., 2001), it is worthwhile to develop a greater empirical base of research from which to evaluate the construct. In studying emotions in a negotiating context, the social functional

theoretical perspective on emotion (e.g., Keltner & Haidt, 1999) guided the development and interpretation of the current findings. Emotions are inherently social, and psychological traditions emphasize the importance of emotion for interpersonal interactions, rather than for individual activities. If emotions provide a valuable mechanism for individuals to coordinate their relationships and interactions with others (Kumar, 1997), then it is important to consider the impact of emotional abilities not only on a focal individual, but also on the others with whom they interact.

## REFERENCES

- Adler, R., Rosen, B., & Silverstein, E. (1998). Emotions in negotiation: How to manage fear and anger. *Negotiation Journal*, (14), 161–179.
- Alfredson T. and Azeta, C. (2008). Negotiation Theory and Practice A Review of the Literature. EASYPol On-line resource materials for policy making. Available at: <http://www.fao.org/easypol/output/>
- Aldosiry K., Alkhadher O., Alaqraa, E. and Anderson N. (2016). Relationships between emotional intelligence and sales performance in Kuwait. *Journal of Work and Organizational Psychology*, (32) 39-45.
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103, 411–442.
- Armstrong, T. (2006). *Inteligencias Múltiples En El Aula: Guía Práctica Para Educadores*. Barcelona: Paidós.
- Ariola, A., y Pérez, H. (1999). Inteligencia emocional: Teoría y praxis en educación. *Revista Iberoamericana de Educación*, 15, 1-5.
- Austing, J.A., Saklofske, D.H., Huang, S.H.S. and McKenney, D. (2004). Measurement of trait emotional intelligence: testing and cross-validating a modified version of Schutte et al.'s (1998) measure. *Personality and Individual Differences*, (36), 555–562.
- Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, (16), 74–94.
- Bar-On, R. (1997). *The Bar-On Emotional Quotient Inventory (EQ-I): A test of emotional intelligence*. Toronto, ON: Multi-Health Systems.
- Barba, M, (2011). *Formas de Negociación*. Available at [http://www.uaeh.edu.mx/docencia/P\\_Presentaciones/huejutla/administracion/temas/formas\\_de\\_negociacion.pdf](http://www.uaeh.edu.mx/docencia/P_Presentaciones/huejutla/administracion/temas/formas_de_negociacion.pdf)

- Baron, R. A. (1990). Environmentally induced positive affect: Its impact on self-efficacy, task performance, negotiation, and conflict. *Journal of Applied Social Psychology*, (20), 368-384.
- Barry, B., & Friedman, R. (1998). Bargainer characteristics in distributive and integrative negotiation. *Journal of Personality and Social Psychology*, (74), 345-359.
- Bearden, W.O., Sharma, S., & Teel, J.E. (1982). Sample size effects on chi square and other statistics used in evaluating causal models. *Journal of Marketing Research*, (19), 425-430.
- Becker, T. (2003). Is emotional intelligence a viable concept? *Academy of Management Review*, (28), 192-195.
- Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, (107), 234-246.
- Bottom, W., & Studt, A. (1993). Framing effects and the distributive aspect of integrative bargaining. *Organizational Behavior and Human Decision Processes*, (56), 459-474.
- Butt, A.N., and Choi, J.N. (2006). The Effects of Cognitive Appraisal and Emotion on Social Motive and Negotiation Behavior: The Critical Role of Agency of Negotiator Emotion. *HUMAN PERFORMANCE*, 19(4), 305-325.
- Carnevale, P.J. and Pruitt, D.G. (1992). Negotiation and mediation. *Annual Review of Psychology*, (43), 531-582.
- Colon, D. E., & Hunt, C. S. (2002). Dealing with feeling: The influence of outcome representations on negotiation. *The International Journal of Conflict Management*, 13(1), 38-58.
- Costa, P.T. Jr. & McCrae, R.R. (1992). Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) manual. Odessa, FL: Psychological Assessment Resources.
- Davies, M., Stankov, L., & Roberts, R.D. (1998). Emotional intelligence: In search of an elusive construct. *Journal of Personality and Social Psychology*, (75), 989-1015.
- Foo, M.D., Elfenbein, H.A., Tan, H.H. and Aik, V.C. (2005). Emotional Intelligence and Negotiation: The Tension Between Creating and Claiming Value. *The International Journal of Conflict Management*, 15(4), 411-429.
- Fornell, C., & Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, (18), 39-50.

- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York: Basic Books.
- Goering, K. (1997). Integration versus distribution in contract negotiations: An interaction analysis of strategy use. *The Journal of Business Communication*, (34), 383-400.
- Goldberg, L. (1993). The structure of phenotypic personality traits. *American Psychologist*, 48(1), 26-34.
- Goleman D. (1996). *Emotional Intelligence*. Barcelona, España: Kairós.
- Graham, J., Mintu, A., & Rodgers, W. (1994). Explorations of negotiation behaviors in ten cultures using a model developed in the United States. *Management Science*, 40(1), 72-95.
- Greenhalgh, L., Neslin, S., & Wilkey, R. (1985). The effects of negotiator preferences, situational power, and negotiator personality on outcomes of business negotiations. *Academy of Management Journal*, 28, 9-33
- Groves, K., Feyerherm, A. and Gu, M. (2014). Examining Cultural Intelligence and Cross - Cultural Negotiation Effectiveness. *Journal of Management Education*, 39(2), 209-243.
- Hakkak M., Nazarpoori A., Najmeddin S. and Ghodsi M. (2015). Investigating the effects of emotional intelligence on social-mental factors of human resource productivity. *Journal of Work and Organizational Psychology*, (31), 129-134.
- Harnett, D., & Cummings, L. (1980). The Person in bargaining. In D. Harnett & L. Cunimings (Eds.), *Bargaining behavior: An international study* (pp. 81-116). Houston: Dame.
- Hegtvedt, K. A., and Killian, (1999). Fairness and emotions: Reactions to the process and outcomes of negotiations. *Social Forces*, 78 (1), 269-303.
- Jordan, P. J., Ashkanasy, N. M., & Härtel, C. E. J. (2003). The case for emotional intelligence in organizational research. *Academy of Management Journal*, (28), 195-197.
- Keltner, D., & Haidt, J. (1999). Social functions of emotions at four levels of analysis. *Cognition and Emotion*, (13), 505-521.
- King, W. & Hinson, T. (1994), The influence of sex and equity sensitivity on relationship preferences, assessment of opponent, and outcomes in a negotiation experiment. *Journal of Management*, (20), 605-624.
- Klein, P.D. (1998). A response to Howard Gardner: Falsifiability, empirical evidence, and pedagogical usefulness in educational psychology. *Canadian Journal of Education*, 23(1), 103-112.

- Kumar, R. (1997). The role of affect in negotiations: An integrative overview. *Journal of Applied Behavioral Science*, 33, 84–100.
- Law, K. S., Wong, C. S., & Song, L. J. (2004). The construct and criterion validity of emotional intelligence and its potential utility for management studies. *Journal of Applied Psychology*, (89), 483–496.
- Macías M. (2002). Las Múltiples Inteligencias. *Psicología desde el Caribe*, (10), 27-38.
- Magnano P., Craparo G. and Paolillo A. (2016). Resilience and Emotional Intelligence: which role in achievement motivation. *International Journal of Psychological Research*, 9(1), 9-20.
- Marie, A. (2013). La Teoría De Las Inteligencias Múltiples En La Enseñanza De Español. Máster Universitario. Universidad de Salamanca, España.
- Matthews, G., Zeidner, M., & Roberts, R. D. (2002). Emotional intelligence: Science and myth. Cambridge, MA: MIT.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2000). Models of emotional intelligence. In R. J. Sternberg (Ed.), *Handbook of intelligence* (396–420). Cambridge, UK: Cambridge University Press.
- Medina, Karla (2013). Perfil del negociacion. Available at <https://educacionvirtual2013.wordpress.com/2013/04/16/perfil-del-negociador/>
- Minyu-Wimsatt, A. (2002). Personality and Negotiation Style: The Moderating Effects of Cultural Context. *Thunderbird International Business Review*, 44(6) 729-748
- Molero C., Martínez C. and Saiz V. (1998). Revisión histórica del concepto de inteligencia: una aproximación a la inteligencia emocional. *Revista Latinoamericana de Psicología*, 11-30.
- Mometolo T. A. (2012). Teoría, tipos y etapas de la negociación. Available at <http://www.gestiopolis.com/teoria-tipos-etapas-negociacion/>
- Nazir A. and Nam, J. (2006). The Effects of Cognitive Appraisal and Emotion Behavior: The Critical Role of Agency of Negotiator Emotion. *Human Performance*, 19(4), 305-325.
- Nikolova, K., and Taneva-Shopova, S. (2007). Multiple intelligences theory and educational practice. 26 (2). *Annual Assessment Zlatarov University*: 105–109.
- Palmer, B., Donaldson, C., & Stough, (2002). Emotional intelligence and life satisfaction. *Personality and Individual Differences*, (33), 1091–1100.
- Pruitt D.G. (1981). *Negotiation behavior*. Academic Press, New York.



- Putnam, L.L. and Jones T.S. (1982). Reciprocity in negotiations: an analysis of bargaining interaction. *Communication Monographs*, (49), 171-191.
- Roberts, R. D., Zeidner, M., & Matthews, G. (2001). Does emotional intelligence meet traditional standards for an intelligence? Some new data and conclusions. *Emotion*, (1), 196-231.
- Rubin J.Z. and Brown, B.R. (1975). *The social psychology of bargaining and negotiation*. Academic Press, New York.
- Salovey, P. & Mayer, J.D. (1990). Emotional intelligence. *Imagination, Cognition and Personality*, (9), 185-211.
- Saner, R. (2008). *The theory and practice of negotiation*. Leiden, The Netherlands: Martinus Nijhoff.
- Scarr, S. (1985). An author's frame of mind [Review of Frames of mind: The theory of multiple intelligences]. *New Ideas in Psychology*, 3(1), 95-100.
- Sharma, S., Bottom, W. and Anger H. (2013). On the role of personality, cognitive ability, and emotional intelligence in predicting negotiation outcomes: A meta-analysis. *Organizational Psychology Review*, 3(4), 293-336.
- Shure, G., & Meeker, R. (1967). Personality attitude schedule for use in experimental bargaining studies. *The Journal of Psychology*, (65), 233-252.
- Thompson, L. (1990). Negotiation behavior and outcomes: Empirical evidence and theoretical issues. *Psychological Bulletin*, (108), 515-532.
- Van, G. and Van P. (2008). What Other's Disappointment May Do to Selfish People: Emotion and Social Value Orientation in a Negotiation Context. *Personality and Social Psychology Bulletin*, 34(8), 1084-1095.
- Wail, J., & Blum, M. (1991). Negotiations. *Journal of Management*, (17), 273-303.
- Wong, C., Law, K., & Wong, P. (2004). Development and validation of a forced choice emotional intelligence measure for Chinese respondents in Hong Kong. *Asia Pacific Journal of Management*, 21(4), 535-559.
- Westbrook, K. (1996). Coordinative maneuvers during buyer-seller negotiations. *Industrial Marketing Management*, (25), 283-292.
- Zhang, Z-X. and Han Y-L. (2004). The effects of reciprocation wariness on negotiation behavior and outcomes. *Springer Science+Business Media B.V.* 2007, (1), 507-508.

---

# Chapter 2

---



## Adaptation and Anticipation to the Future by the Small and Medium Enterprises at the Metropolitan Zone of Guadalajara

*By Luis Alberto Bellón-Álvarez, Francisco Javier López-Cerpa, Martha Filomena Muñoz-Fajardo, Juan Antonio Vargas-Barraza*



# Adaptation and Anticipation to the Future by the Small and Medium Enterprises at the Metropolitan Zone of Guadalajara

Luis Alberto Bellon-Álvarez  
Francisco Javier López-Cerpa  
Martha Filomena Muñoz-Fajardo  
Juan Antonio Vargas-Barraza  
Universidad de Guadalajara, México

## INTRODUCTION

Change is a constant in the world. Since the dawn of humankind and the civilization the change has been present and nowadays there are many factors that require for companies to react faster in order to continue operating in the markets. Changes involve persons, and can call up sentiments, uncertainties and contradictions.



Change is constantly present and is one of the essential aspects of good administration, as it is becoming more recurrent and complex, with greater impact. The competition between companies is getting more difficult. The importance of the study of organizational change lies in the widespread hypothesis that organizations must be in constant transformation, so it is very important to comprehend the way firms change, as well as the reasons they have to make these changes or not. The adaptability is fundamental to face the environment's uncertainty in a successful way. So firms need to be adapted and to adequate themselves to those changes that are happening in the worldwide. Also the remaining companies in the markets have to plan the actions for the future and be more competitive day by day. In addition, it's extremely important to know what factors are involved in organizational change, such as the uncertainty in the environment, as well as the resistance to change that exists in employees when the company has an organizational change.

## 1. CHANGE IN ORGANIZATIONS.

The unpredictability and uncertainty of change is an aspect mentioned by several authors who study organizational change, including Kim, Eugene and Seongsoo (2013). Xu, Payne, Horner and Alexander (2016), Mintzberg (1990), Chih, Yang and Chang (2012), Maldonado, Sanchez, Mejia and Gaytan (2013), Rafferty, Jimmieson and Armenakis (2013), Bordia, Kiazad, Restubog, DiFonzo, Stenson and Tang, (2014), Hirsh, Mar and Peterson (2012), Van den Heuvel, Schalk and Van Assen (2016), Van der Voet (2015), Hirsh and Kang (2016), and Siegel (2016).

The actual aspect of the environment in the markets is described by being more and more competitive and persistently changing, so companies require to adapt to those changes, and even to anticipate them (Zaleznik, 1992; Nohria & Berkley, 1994; Bordia et al., 2004; Charbonnier-Voirin & El Akremi, 2011; Smollan, 2015; Mintzberg, 1990; Rafferty, Jimmieson & Armenakis, 2013; MacKay & Chia, 2013; Lord & Dinh, 2015; Xu, Payne, Horner & Alexander, 2016).

The incessant changes in the world become into uncertainty in the social order, unceasing fears about change in this era. The technological advances reduce the useful lives of employees' assets and abilities in a labor market in which peer competitiveness becomes progressively more severe. An immediate effect of organizational change is this rise of uncertainty, which is one of the most common psychological conditions that people suffer in an organizational change process (Bordia et al., 2004). For Liu, Caldwell, Fedor & Herold (2012), the cultural change in organizations generates uncertainty, having notorious impact in employee's attitudes, such as the incapacity of a person to precisely predict something. And also it refers to a mental state during which individuals cannot adequately predict what will happen in the immediate future (Milliken, 1987). Uncertainty sometimes results in employee's resistance to change (Xu, Payne, Horner & Alexander, 2016), and a resistance to share information. (Clampitt & Williams, 2005).

There are an increasing number of texts about the uncertainties nature and effects, in an organizational change (Hirsh, Mar & Peterson, 2012; Hirsh & Kang, 2016; Siegel, 2016; DiFonzo & Bordia 1998; Maurier & Northcott 2000; Nelson, Cooper & Jackson, 1995; Pollard, 2001; Rafferty et al., 2013; Schweiger & Denisi, 1991; Terry, Callan & Sartori, 1996; Bordia et al., 2014). Although these authors have pointed out the existence of uncertainty and its adverse consequences for the

psychological wellness of the staff, there is a limited research about the exact psychological mechanism that describes the negative consequences of uncertainty.

During an organizational change, the uncertainty of future and changes in jobs, can cause fear among the workforces, and influence their attitudes, so the greater the changes in the organization, this will cause uncertainty and negative reactions in the workers, which may influence their performance. So management needs to reduce that fear and uncertainty, so that employees support organizational change. (Chih, Yang & Chang, 2012).

Since neuropsychology's perspective, anxiety, uncertainty and behavioral conflicts are indistinguishable (Hirsh et al., 2012). That is why people have to face personally the conflicts of behavior, such as anxiety and uncertainty, about a course of action that is appropriate caused by identification with numerous social groups, roles and experienced values (Hirsh & Kang, 2016).

Changes have intense repercussions for workers; they have to deal with uncertainty and stress that are connected with the changing work environment and bigger work demands (Bordia et al., 2011, Bordia et al., 2014; Bordia et al., 2006; Jimmieson, Terry, & Callan, 2004). An uncertain environment has many negative consequences, both for the wellness of people, as well as satisfaction in the organization. It is linked with stress (Ashford, 1988; Pollard, 2001; Schweiger & Denisi, 1991); and with intentions of rotation (Greenhalgh & Sutton, 1991; Johnson, Bernhagen, Miller & Allen, 1996). It is also related negatively with job satisfaction (Ashford, Lee & Bobko, 1989; Nelson, Cooper & Jackson, 1995), commitment (Ashford et al., 1989; Hui & Lee, 2000), and trust in the organization (Schweiger & Denisi, 1991; Bordia et al., 2014).

During organizational change the employees face uncertainty about the nature and consequences of change (Bordia & DiFonzo, 2013). The change in organizations is determined by uncertainty and ambiguity, and the relevant and accurate information doesn't exist regularly (Chaudhry & Jiwen, 2014). When there is not reliable information regarding organizational culture change, this causes rumors and uncertainty (Van



den Heuvel, Schalk & Van Assen, 2016); and these rumors serve to give employees meaning to change, and thus predict the nature of these changes (Bordia et al., 2014). The negative consequences of an unpredictable environment on psychological wellness are caused by the feelings of lack of control that the uncertainty itself generates (Bordia et al., 2004; DiFonzo & Bordia, 2002; Lazarus & Folkman, 1984). Therefore, communication contributes considerably serving as a guide in a process of change in organizations (Campbell, Carmichael & Naidoo, 2015). Good communication reduces uncertainty in relation to changes that are going to be implanted (Van der Voet, 2015).

The environment's uncertainty, or the confusion about present or future events, impairs our aptitude to influence or control such events. This absence of control has negative effects, such as anxiety (DiFonzo & Bordia, 2002), psychological stress (Spector, 2002; Terry & Jimmieson, 1999), learned impotence (Martinko & Gardner, 1982), and lower yield (Bazerman, 1982; Orpen, 1994). Bigger uncertainty with one's job future and potential for professional progress subsequent to a change were also positively related with change recipients' rotations (Fried, et al. 1996; Johnson, et al. 1996). In the other hand, communication about the change was associated with several of other reactions like inferior levels of angst and uncertainty, improved trust in management, and some consequences like less rotations (Ashford, 1988; Bordia. et al. 2004; Gopinath & Becker, 2000; Johnson, Bernhagen, Miller, & Allen, 1996; Miller & Monge, 1985; Miller. et al. 1994; Paterson & Cary, 2002).

The complex characteristics existing in the modern working environment force the personnel capability to assimilate new abilities, and to adapt them to new circumstances motivated by the change process; these skills are critical to succeed in organizational competitiveness. These behaviors in the work environment, which are linked in an adaptive performance concept, are necessary to get the company's objectives in an environment characterized by continuous change, convolution and uncertainty (Charbonnier-Voirin & El Akremi, 2011).

Today, world's uncertainty is bigger, influenced by economic and international circumstances (Siegel, 2016). Taleb (2010), specifies that the world changes in an unpredictable way, reason why it's hard to anticipate these changes. Such unanticipated changes could be explicated as a result of a wild environment characterized by unstoppable changes (MacKay & Chia, 2013). Specialists in organizational studies have pointed

out that irregular changes cannot be anticipated certainly. (MacKay & Chia, 2013; Plowman et al., 2007). This has facilitated the emergence of new aptitudes such as adaptability, which previously didn't occurs (Lord & Dinh, 2015). In a different research, use of maladaptive defense mechanisms, such as refutation, disconnection, and isolation generated bigger resistance to an organizational change in contrast with the use of adaptive mechanisms, like humor and anticipation (Bovey & Hede, 2001; Oreg, Vakola, & Armenakis, 2011).

Opposing to another researches on support, in one research about numerous firms, management involvement was measured by aggregating change recipients' support evaluations to the organizational level. This aggregate evaluation of management involvement was found to be fundamental in inducing change recipients' adaptation in changing role demands (Caldwell et al., 2004).

Nohria and Berkley (1994) specify that pragmatic managers are sensitive to the organization's context, and are open to the uncertainty surrounding change; and Mintzberg (1990) indicates that any firm can anticipate all contingencies that may arise in an uncertain environment.

By the other hand, Nohria & Berkley (1994) say that actions that are successful in the present can lead to ruin a company in the future. Nohria & Berkley (1994) argue that a prosperous change initiative in one situation, may fail in another, and this can be associated to the fact that many organizations fail when they take actions that were previously successful, but those actions in the current circumstances leads them to failure for not adapting to the changes that occur over the time in the market's environment that surrounds the firm. One of the first goals of an effective action in a company is the capability to adapt to the environment (Bordia et al., 2014). That is why firms that value adaptability and improvement, admit changes better than stability-oriented organizations (Rafferty, Jimmieson & Armenakis, 2013).

Changes in markets are unpredictable and irregular. Taleb (2010), point out that we are in a new and unpredictable world; where the old techniques that gave results in a world with a slower pace are already useless; so that what is established and true formerly has no validity at present-day; this requires a new way of thinking, to adapt and anticipate changes, and the increasing competition (Chih, Yang & Chang, 2012).

A change in self-efficacy leads to less uncertainty in an organizational culture change process (Xu, Payne, Horner & Alexander, 2016). Hogg and



Terry (2000) propose that decreasing uncertainty may be more adaptive because it defines Who we are and What to do. Organizational change is a context in which the demanding situations have to face up to the anticipated results (Smollan, 2015). A company can be huge and intricate and at the same time be capable to adapt in an organized and successful manner to changes, which shows that these changes are faster and unexpected.

In short, today, uncertainty is an intrinsic part of the environment and markets, which is why companies need to adapt and anticipate the future and their changes to be better prepared to deal with the environment and the unpredictable changes. Today, prosperous organizations must have the ability to anticipate changes, and even to provoke these changes.

## 2. RESEARCH METHODOLOGY.

The methodology for this research consisted of two parts: first a stage of theoretic and academic nature that examined the state of the art of the studied subject; and a second phase, the experimental study. In order to carry out the fieldwork of this project, an instrument was elaborated that consisted of a questionnaire of closed questions, in which the different alternatives were included as possible answers to each question.

### 2.1 Unit of analysis.

To be part of the research, the companies must be: 1) micro, small and medium organization (1 to 250 employees); 2) commercial organizations; and, 3) placed in the Metropolitan Zone of Guadalajara (MZG), including Guadalajara, Zapopan, Tlaquepaque and Tonalá. These type of firms were studied, as part of this research project.

### 2.2. Sample.

For this research a non-probabilistic sampling was used and the questionnaire was applied to 78 individuals who belong to 78 micro, small and medium commercial firms situated in the MZG, whose organizations underwent a process of organizational change.

### 2.3. Operationalization of Variables.

To make this research study the variables were operationalized using Likert Scale enquiries into the questionnaire (McDaniel Jr. & Gates, 2015).

### 2.4. Problem Statement.

This research seeks to find the factors and effects related to Adaptation and anticipate the future and its changes that are involved in an Organizational Change process in commercial firms located in the MZG.

The Adaptation and anticipation of the future and its changes have an effect in an Organizational Change, having an influence in company's performance.

For the study project that was realized, the research questions were:

- What are the factors related to Adaptation and anticipate the future and its changes, which intervene by facilitating or hindering an organizational change in commercial firms located in the MZG?
- What are the effects of Adaptation and anticipate the future and its changes, in a process of organizational change in commercial firms located in the MZG?

## 2.5. Research objectives.

### 2.5.1. General objective.

Analyze the factors and effects related to Adaptation and anticipate the future and its changes, which are involved in a process of implementation of an Organizational Change in commercial firms located in the MZG.

### 2.5.2. Specific objectives.

Identify what factors related to Adaptation and anticipate the future and its changes are involved in a process of implementation of an Organizational Change in commercial firms located in the MZG, whether they facilitate or make it difficult.

## 2.6. Hypothesis.

Within this research project the hypotheses are as follows:

H1: Adaptation facilitates the implementation of a process of organizational culture change in commercial firms located in the MZG.

H2: Anticipating the future and its changes contribute to the implementation of a process of organizational culture change in commercial firms located in the MZG.

## 2.7. Collection and processing of information.

This study tries to find the influence of Adaptation and anticipate the future and its changes, in an organizational change. In addition, this investigation searched for the degree of significance in an ANOVA analysis, relating to the variables of Adaptation and Anticipating the future and its changes, and its effects on an organizational change. Also

this research seeks certain factors, which may favor or hinder the implantation of an organizational change.

The questions of the survey used as part of this research were designed based on the bibliographic review, which sought to identify the factors related to Adaptation and anticipate the future and its changes, which intervene in an organizational change process. So, a questionnaire with choice questions was developed to identify these factors. Once the information was collected, the data were analyzed and classified, to generate the results of this research project.

### 3. RESULTS OF FIELD RESEARCH AND DISCUSSION

As part of this research project, some questions were asked to determine in what way Adaptation and Anticipating the future and its changes were factors that favored organizational change, indicating how often they presented, and how these factors impact in an organizational change.

Table 1. Relationship of Adaptation with an Organizational Change Process  
ANOVAS

	SIG.
Accept taking calculated risks	.000
Actions are taken to develop an attitude of openness to change	.019
Actions are taken to promote leadership	.036
Adequate information is available?	.000
After the change, do employees felt motivated?	.015
Anticipating the future and its changes	.022
Are the existing needs and pressures known, to achieve change?	.059
Benchmarking	.020
Competitively the company is working better after the change than before	.012
Coordination of activities	.031
Create planned and controlled crises and conflicts	.003
Employee´s education	.001
Feedback	.004
Management Involvement	.050
Positive attitude of Management	.001
The reaction of staff to change was favorable?	.011
Team Learning	.012
Shared Vision	.011
Uncertainty	.042
Was the staff willing to change?	.018

Source: Own elaboration based on the results achieved in the research project.

In addition, there were considered certain questions and hypotheses that address the effect of uncertainty in a process of organizational change.

This study found that adaptation favors organizational change in a significantly way. The data collected, reveals a substantial relationship between adaptation, with: Actions are taken to develop an attitude of openness to change, After the change, do employees felt motivated?, Are the existing needs and pressures known to achieve change?, Benchmarking, Coordination of activities, Feedback, Employee's education, Were the staff willing to change?, The reaction of staff to change was favorable?, Team Learning, Shared vision, Accept taking calculated risks, Management Involvement, Positive attitude of Management and Competitively the company is working better after than before the change.

Similarly, there is a relationship between Uncertainty and Adaptation, as well as between Adaptation and Anticipating the future and its changes; these results means that in an uncertain environment, it's essential that an organization has the ability to adapt to changes that come, and even anticipate them, this will help in an organizational change, to get it. These results correspond with that established by Lord and Dinh (2015), Taleb (2010), Nohria and Berkley (1994), Charbonnier-Voirin and El Akremi (2011), Bordia and others (2014), Rafferty, Jimmieson and Armenakis (2013), Xu, Payne, Horner and Alexander (2016), who said that we live in an unpredictable world, old methods are useless; a new vision is required to adapt and anticipate changes, in order to reduce uncertainty, and in that way, firms can get employees support to the organizational change process (Chih, Yang & Chang, 2012).

The table 2 shows the relation of anticipating the future and its changes with an Organizational Change process. As the results indicates, there is a significant relationship between anticipating the future and its changes, with several factors and questions such as: Actions are taken to develop an attitude of openness to change, Actions are taken to promote leadership, Adaptation, Create planned and controlled crises and conflicts, After the change there was order?, A measurement of the organizational culture change results is made, Employee's education, Employees performance was recognized and rewarded, Was there a need to be able to handle continuous change, not just modest change projects ?, Adequate information is available, Coordination of activities, Shared

vision, As a result of change: staff developed new skills, and Positive Attitude and Management Involvement.

The results of the research coincide with Nohria & Berkley (1994), Taleb (2010), Chih, Yang & Chang (2012) and Smollan (2015); which say that the world is changing and it's uncertain, the procedures need to change; so firms must anticipate the changes that come in the future, to be more competitive.

Table 2. Anticipating the future and its changes and its relation with the Organizational Change. ANOVAS

	SIG.
A measurement of the organizational culture change results is made	.024
Actions are taken to develop an attitude of openness to change	.011
Actions are taken to promote leadership	.036
Adaptation	.002
Adequate information is available?	.015
After the change there was order?	.002
As a result of the change, staff developed new skills and abilities	.022
Coordination of activities	.048
Create planned and controlled crises and conflicts	.038
Employee's education	.005
Employees performance was recognized and rewarded	.033
Management Involvement	.039
Positive attitude of Management	.000
Shared Vision	.025
Was there a need to be able to handle continuous change, not just modest change projects?	.007

Source: Own elaboration based on the results achieved in the research project

In conclusion, this research project reveals that anticipating the future and its changes significantly favors the process of culture change in organizations. The results of this research indicate that there is a relationship between Uncertainty with some factors like: Anticipating the future and its changes, Adaptation, Resistance to chance, as a result of the change, staff developed new skills and abilities and the competitors. Also, the research results show that management has a fundamental role in an organizational change process, since it was found that there is a close relationship between adaptation, as well as anticipate the future and its changes, with Management Involvement and Positive attitude of Management, which indicates that it's a factor that favors in a very important way the process of organizational change. Other factors that also favorably influence a process of organizational change according to

the results of the research are: Create planned and controlled crises and conflicts, Actions are taken to develop an attitude of openness to change, Actions are taken to promote leadership, Adequate information is available, Employee's education and Coordination of activities.

Table 3. Uncertainty and its relation with an Organizational Change Process.

#### ANOVAS

	SIG.
Adaptation	.031
Anticipate the future and its changes	.037
Resistance to chance	.001
As a result of the change, staff developed new skills and abilities	.007
Competitors	.057

Source: Own elaboration based on the results achieved in the research project

Uncertainty is defined as the incapacity to precisely predict results and consequences resulting from the absence of information (Milliken, 1987). Also, uncertainty is an aversive state that provokes plans designed to deal with it, and frequently reveals a deficiency of visualization and planned direction by the organizational change leaders (Kotter, 1996). An organizational change process causes uncertainty (Lawrence & Callan, 2010; Paulsen et al., 2005). So, in the course of change, another source of tension were uncertainty (Smollan, 2015). During an organizational change process workers are challenged with uncertainty about the nature and costs of the change (Bordia & DiFonzo, 2013). Management communication and involvement is effective to diminish uncertainty about planned aspects of the organizational change process (Bordia et al., 2004).

So, Hypotheses are accepted. Adaptation facilitates the implementation of a process of organizational culture change in commercial firms located in the MZG. Anticipating the future and its changes contribute to the implementation of a process of organizational culture change in commercial firms located in the MZG (Tables 1, 2, 3).

## CONCLUSIONS

Changes are inevitable in companies, and there are persistent in our world. Competition is getting harder and consumers are stricter, so companies must meet as soon as possible the customer's needs and desires. The changes in the environment, means that firms must adapt to this new horizon of uncertainty that exists in the market and in the business. These firms must make changes in their organization, their

manufacturing processes and in their organizational philosophy. In order to be able to adapt and adjust to the new characteristics of this unforeseen business environment that exists in the world, and in this way to remain in the market, seeking to be more competitive and efficient.

The never-ending changes in the business environment are a clear sign of the unpredictable environment in markets. Changes are needed in the organizational structure of firms, in manufacturing and administration systems, in the use of new technologies, and to develop new goods and services that better satisfy the consumer's desires and necessities. The bigger speed of change in the world has produced greater complications for managers; they are fighting to help their firms' adaptation. So today's companies must have constant learning. They cannot remain static, because if they do, the competitors would outdo them. An important aspect in company's failure to adapt to changes in international markets is the deficiency of the change direction. Leaders, who can efficaciously complete changes, describe themselves as change leaders. Successful companies don't wait to react to changes in their environment, they anticipate and induce changes, in order to retain their leadership and force competition to be the one that have to react and adapt to those changes. Leaders define a future company's vision in intense expressions; they also define the principles that promote change and adaptability in their organizations. While making an organizational change can be expensive, the truth is that when it's done accurately, the benefits are bigger, because systems and processes are better, helping to cut expenses; and the investment in this procedure contributes to the savings gained through the reduction of costs that the company has, and also being more competitive.

As part of this research project that discusses the effect of Adaptation and anticipate the future and its changes, in an Organizational Change; it was revealed that both factors favor change in organizations. This is noted in the results obtained in this study, since it illustrates that there is a relationship between Adaptation and Uncertainty, within a process of Organizational Change and because competitively the company works better after the change. Also, this research found that there are significant relationships between the Adaptation with: After the change, do employees felt motivated?, Are the existing needs and pressures known to achieve change?, Benchmarking, Feedback, Employee's education, Were the staff willing to change?, The reaction of staff to

change was favorable?, Team Learning, Shared vision, Accept taking calculated risks. It was also found that there are very important relationships between Anticipating the future and its changes with: Actions are taken to promote leadership, Shared Vision, As a result of change, staff developed new skills and abilities, and after the change there was order; which ratifies that these factors help to the implementation of an organizational culture change.

The results of this research show that the executives have a main role in an organizational change process, since it was found that there is an important relation between adaptation, and anticipate the future and its changes with a Positive Attitude of Management and Management Involvement which indicates that it's a factor that considerably favors an organizational culture change. Other factors that also favorably impact an organizational change process in firms, according to the research's results are: Actions are taken to develop an attitude of openness to change in the staff, Adequate information is available, Create planned and controlled crises and conflicts, and Coordination of activities.

It is not possible to predict what is going to happen in the future, but whether it's possible, is to be prepared to what that future brings with it. Therefore, in an uncertain world, it's fundamental that a firm be able to adapt to and even anticipate changes, since this will help to carry out the organizational culture change process. It's necessary to help employees to deal with uncertainty, and get a better knowledge of its nature and reaction to uncertainty. It's imperative an appropriate preparation by firms and their members, because, in that way they can effectively face the challenges of the future.

The study of organizational change it's important because firms are in continuous evolution, so it's essential to know the way organizations change, and the motives they have to make those changes or not. An organization can be very big, but at the same time have the capability to adapt to changes, which are becoming more vertiginous and are presented without advice. It is necessary the right preparation of organizations to anticipate those changes.

For future study projects it is suggested to do case studies in organizations that are immerse in an organizational change process. It's proposed to do this kind of study in firms at national level. Also, it's recommended to carry out similar researches like this one, in companies of other line business, such as the industrial, or the service sectors.



Organizational changes are necessary to continue in an uncertain business environment that is the one that describes the markets of today. Nowadays, making an organizational change is a tactic to be able to remain in markets for the firms.

## REFERENCES

- Ashford, S. J. (1988). Individual strategies for coping with stress during organizational transitions. *Journal of Applied Behavioural Science*, 24(1), 19-36.
- Ashford, S. J., Lee, C. & Bobko, P. (1989). Content, Causes, and Consequences of Job Insecurity: A Theory-Based Measure and Substantive Test. *The Academy of Management Journal*, 32(4), 803-829.
- Bazerman, M. H. (1982). Impact of personal control on performance: Is added control always beneficial? *Journal of Applied Psychology*, 67(1), 472-479.
- Bordia, P. & DiFonzo, N. (2013). Rumors during organizational change: A motivational analysis. In Oreg, S. & Michel, A. (Eds.), *Psychology of organizational change* (232-252). UK: Cambridge University.
- Bordia, P., Hobman, E., Jones, E., Gallois, C. & Callan, V. (2004). Uncertainty during organizational change: Types, consequences, and management strategies. *Journal of Business and Psychology*, 18(4), 507-532.
- Bordia, P., Hunt, E., Paulsen, N., Tourish, D. & DiFonzo, N. (2004). Uncertainty during organizational change: Is it all about control? *European Journal of Work & Organizational Psychology*, 13(3), 345-365.
- Bordia, P., Jones, E., Gallois, C., Callan, V. J., & DiFonzo, N. (2006). Management are aliens! Rumors and stress during organizational change. *Group and Organization Management*, 31(5), 601-621.
- Bordia, P., Kiazad, K., Restubog, S. D., DiFonzo, N., Stenson, N. & Tang, R. L. (2014). Rumor as Revenge in the Workplace. *Group & Organization Management*, 39(4), 363-388.
- Bordia, P., Restubog, S., Jimmieson, N., & Irmer, B. (2011). Haunted by the Past: Effects of Poor Change Management History on Employee Attitudes and Turnover. *Group & Organization Management*, 36(2), 191-222.

- Bovey, W. H., & Hede, A. (2001). Resistance to organisational change: The role of defense mechanisms. *Journal of Managerial Psychology*, 16(7), 534-548.
- Caldwell, S. D., Herold, D. M., & Fedor, D. B. (2004). Toward an understanding of the relationships among organizational change, individual differences, and changes in person-environment fit: A cross-level study. *Journal of Applied Psychology*, 89(5), 868-882.
- Campbell, K. S., Carmichael, P. & Naidoo, J. S. (2015). Responding to Hostility: Evidence-Based Guidance for Communication During Planned Organizational Change. *Business and Professional Communication Quarterly*, 78(2), 197-214.
- Charbonnier-Voirin, A. & El Akremi, A. (2011). L'effet de l'habilitation sur la performance adaptative des employés. *Relations Industrielles*, 66(1), 122-149.
- Chaudhry, A. & Jiwen, L. (2014). Rethinking Psychological Contracts in the Context of Organizational Change: The Moderating Role of Social Comparison and Social Exchange. *The Journal of Applied Behavioral Science*, 50(3), 337-363.
- Chih, W. W., Yang, F. & Chih, C. (2012). The Study of the Antecedents and Outcomes of Attitude Toward Organizational Change. *Public Personnel Management*, 41(4), 597-617.
- Clampitt, P., DeKoch, R. & Williams, M. (2002). Embracing uncertainty: The hidden dimension of growth. *Ivey Business Journal*, 66(3), 57-67.
- Clampitt, P. G. & Williams, M. L. (2005). Conceptualizing and measuring how employees and organizations manage uncertainty. *Communication Research Reports*, 22(4), 315-324.
- DiFonzo, N. & Bordia, P. (1998). A tale of two corporations: Managing uncertainty during organizational change. *Human Resource Management*, 37(3&4), 295-303.
- DiFonzo, N. & Bordia, P. (2002). Corporate rumor activity, belief and accuracy. *Public Relations Review*, 28(1), 1-19.
- Fried, Y., Tieg, R., Naughton, T., & Ashforth, B. (1996). Managers' reactions to a corporate acquisition: A test of an integrative model. *Journal of Organizational Behavior*, 17(5), 401-427.
- Gopinath, C., & Becker, T. E. (2000). Communication, procedural justice and employee attitudes: Relationships under conditions of divestiture. *Journal of Management*, 26(1), 63-83.

- Greenhalgh, L., & Sutton, R. (1991). Organizational effectiveness and job insecurity. In Hartley, J., Jacobsen, D., Klandermans, B. & van Vuuren, T. (Eds.), *Job insecurity: Coping with jobs at risk* (151–171). London: Sage.
- Hirsh, J. B. & Kang, S. K. (2016). Mechanisms of identity conflict: Uncertainty, anxiety, and the behavioral inhibition system. *Personality and Social Psychology Review*, 20(3), 223–244.
- Hirsh, J. B., Mar, R. A. & Peterson, J. B. (2012). Psychological entropy: A framework for understanding uncertainty related anxiety. *Psychological Review*, 119(2), 304–320.
- Hogg, M. A. & Terry, D. J. (2000). Social identity and self-categorization processes in organizational contexts. *Academy of Management Review*, 25(1), 121–140.
- Hui, C. & Lee, C. (2000). Moderating effects of organization-based self-esteem on organizational uncertainty: Employee response relationships. *Journal of Management*, 26(2), 215–232.
- Jimmieson, N. L., Terry, D. J. & Callan, V. J. (2004). A longitudinal study of employee adaptation to organizational change: The role of change-related information and change-related self-efficacy. *Journal of Occupational Health Psychology*, 9(1), 11–27.
- Johnson, J. R., Bernhagen, M. J., Miller, V. & Allen, M. (1996). The role of communication in managing reductions in work force. *Journal of Applied Communication Research*, 24(3), 139–164.
- Kim, J., Eugene, S. & Seongsoo, L. (2013). Organizational change and employee organizational identification: mediation of perceived uncertainty. *Social Behavior and Personality: An International Journal*, 41(6), 1019–1034.
- Kotter, J. (1996). *Leading change*. Boston: Harvard Business School.
- Lawrence, S., & Callan, V. J. (2010). The role of social support in coping during the anticipatory stage of organizational change: A test of an integrative model. *British Journal of Management*, 22(4), 567–585.
- Lazarus, R. S. & Folkman, S. (1984). *Stress, appraisal, and coping*. New York: Springer.
- Liu, Y., Caldwell, S., Fedor, D. & Herold, D. (2012). When Does Management's Support for a Change Translate to Perceptions of Fair Treatment? The Moderating Roles of Change Attributions and Conscientiousness. *Journal of Applied Behavioral Science*, 48(4).

- Lord, R. G., Dinh, J. E. & Hoffman, E. L. (2015). A Quantum Approach To Time And Organizational Change. *Academy Of Management Review*, 40(2), 263-290.
- MacKay, R. B. & Chia, R. (2013). Choice, change, and unintended consequences in strategic change: A process understanding of the rise and fall of Northco automotive. *Academy of Management Journal*, 56(1), 208-230.
- Maldonado, G., Sanchez, J., Mejia, J., & Gaytan, J. (2013). Flexibility as a Logistics Business Strategy in the Industry Furniture Spain. *European Scientific Journal*, 9(1).
- Martinko, M. J. & Gardner, W. L. (1982). Learned Helplessness: An alternative explanation for performance deficits. *Academy of Management Review*, 7(2), 195-204.
- Maurier, W. L. & Northcott, H. C. (2000). Job uncertainty and health status for nurses during restructuring of health care in Alberta. *Western Journal of Nursing Research*, 22(5), 623-641.
- McDaniel, C. & Gates, R. (2015). *Marketing Research Essentials*. New Jersey: Wiley.
- Miller, K. I., & Monge, P. R. (1985). Social information and employee anxiety about organizational change. *Human Communication Research*, 11(3), 365-386.
- Miller, V. D., Johnson, J. R., & Grau, J. (1994). Antecedents to willingness to participate in a planned organizational change. *Journal of Applied Communication Research*, 22(1), 59-80.
- Milliken, F. J. (1987). Three types of perceived uncertainty about the environment: State, effect, and response uncertainty. *The Academy of Management Review*, 12(1), 133-143.
- Mintzberg, H. (1990). The manager's job: folklore and fact. *Harvard Business Review*, 90(2), 163-176.
- Nelson, A., Cooper, C. L. & Jackson, P. R. (1995). Uncertainty amidst change: The impact of privatization on employee job satisfaction and well-being. *Journal of Occupational and Organizational Psychology*, 68(1), 57-71.
- Nohria, N. & Berkley, J. D. (1994). Whatever happened to the take-charge manager? *Harvard Business Review*, 72(1), 128-137.
- Oreg, S., Vakola, M. & Armenakis, A. (2011). Change Recipients' Reactions to Organizational Change: A 60-Year Review of Quantitative Studies. *The Journal of Applied Behavioral Science*, 47(4), 461-524.

- Orpen, C. (1994). The Effects of Organizational and Individual Career Management on Career Success. *International Journal of Manpower*, 15(1), 27–37.
- Paterson, J. M., & Cary, J. (2002). Organizational justice, change anxiety, and acceptance of downsizing: Preliminary tests of an AET-based model. *Motivation and Emotion*, 26(1), 83–103.
- Paulsen, N., Callan, V. J., Grice, T. A., Rooney, D., Gallois, C., Jones, E., Jimmieson, N.L., & Bordia, P. (2005). Job uncertainty and personal control during downsizing: A comparison of survivors and victims. *Human Relations*, 58(4), 463–496.
- Plowman, D. A., Baker, T. E., Kulkarni, M., Solansky, S. T. & Travis, D. V. (2007). Radical change accidentally: The emergence and amplification of small change. *Academy of Management Journal*, 50(3), 515–543.
- Pollard, T. M. (2001). Changes in mental well-being, blood pressure and total cholesterol levels during workplace reorganization: The impact of uncertainty. *Work & Stress*, 15(1), 14–28.
- Rafferty, A. E. & Griffin, M. A. (2006). Perceptions of organizational change: A Stress and coping perspective. *Journal of Applied Psychology*, 91(5), 1154–1162.
- Rafferty, A., Jimmieson, N., & Armenakis, A. (2013). Change Readiness: A Multilevel Review. *Journal of Management*, 39(1), 110–135.
- Schweiger, D. M. & Denisi, A. S. (1991). Communication with employees following a merger: A longitudinal field experiment. *Academy of Management Journal*, 34(1), 110–135.
- Siegel, G. (2016). FOMC Minutes: Increased Uncertainty, Too Soon to Change Outlook. *Health Business Elite*, 1(34462), 1–1.
- Smollan, R. K. (2015). The Personal Costs of Organizational Change: A Qualitative Study. *Public Performance & Management Review*, 39(1), 223–247.
- Spector, P. E. (2002). Employee control and occupational stress. *Current Directions in Psychological Science*, 11(4), 133–136.
- Taleb, N. (2010). *The black swan*. London: Penguin.
- Terry, D. J., Callan, V. J. & Sartori, G. (1996). Employee adjustment to an organizational merger: Stress, coping and intergroup differences. *Stress Medicine*, 12(2), 105–122.
- Terry, D. J. & Jimmieson, N. (1999). Work control and employee well-being: A decade review. *International Review of Industrial and Organizational Psychology*, 14(1), 95–148.

- Van den Heuvel, S., Schalk, R. & Van Assen, M. (2016). Does a Well-Informed Employee Have a More Positive Attitude Toward Change? The Mediating Role of Psychological Contract Fulfillment, Trust, and Perceived Need for Change. *The Journal of Applied Behavioral Science*, 51(1), 1-22.
- Van der Voet, J. (2015). Change Leadership and Public Sector Organizational Change: Examining the Interactions of Transformational Leadership Style and Red Tape. *American Review of Public Administration*, 46(6), 660-682
- Xu, X., Payne, S. C., Horner, M. T. & Alexander, A. L. (2016). Individual difference predictors of perceived organizational change fairness. *Journal of Managerial Psychology*, 31(2), 420-433.
- Zaleznik, A. (1992). Managers and leaders: are they different? *Harvard Business Review*, 70(2), 126-135.



---

# Chapter 3

---



## Impact of Cronyism in Mexican Multinationals

*By Jorge Pelayo-Maciél, Manuel Alfredo Ortiz-Barrera and  
Tania Elena González-Alvarado*





# Impact of Cronyism in Mexican Multinationals

Jorge Pelayo-Maciel  
Manuel Alfredo Ortiz-Barrera  
Tania Elena González-Alvarado  
Universidad de Guadalajara, México

## INTRODUCTION

This work seeks to analyze how the cronyism, even known as friendship networks, can affect the Mexican multinationals. This is because the importance of having partner networks to develop a synergy to consolidate resulting businesses from such networks. The term has its origin in “social exchange, whose main analysis are relations between the actors” that can be defined as well like a “reciprocal exchange transaction, where agent “A” shows a favorable action to agent “B”, based on shared membership in a social network at expense of agent “C”; where a valuable resource is claimed (Khatri, Tsang & Begley, 2006).

Authors explains that cronyism must exist if “there are a reciprocal exchange where agent “A” gives some value to “B”, and this agent will give something to his partner in the future. In second place, exchange could be tangible or intangible, and third, members in group are based in kinship, friendship, ethnicity, religion, school, workplace, mutual interest, among others; all these forms are basic in favoritism”. To contextualize, a social network is a perspective where agents, seen as individuals, groups and organizations, form a set of interconnected relationships where the behavior of their members is established (Granovetter, 1985; Adler & Kwon, 2002; Borgatti & Foster, 2003; Brass et al., 2004; Inkpen & Tsang, 2005; Begley, Khatri & Tsang, 2010); also the concept can be defined as a “set of agents with one or more relations between them. These actors can be any kind of meaningful social unit, including individuals, collective entities, companies, organizations, [...] such relationships can be formal,

affective (friendship or respect), social interactions, workflows, As not commercial materials and alliances" (Contractor, Wasserman & Faust, 2006).

A business group is therefore a social network (Goto, 1982; Keister, 1998; Yiu, Bruton & Lu, 2005; Chacar & Vissa, 2005; Carney et al., 2011) where it can generate a cronyism (Mathews, 1998; Claessens & Fan, 2002; Chang & Shin, 2006; Carney, 2008; Keles, Özkan & Bezirci, 2011; Chen & Miller, 2011; Barnett, Yandle & Naufal, 2013), since this term as "a set of companies that are controlled by a small group of majority shareholders, usually members of a family or a group of associates with Social or ethnic nexuses "(Chavarin, 2011: 194). The family having ownership or possession of capital of the enterprise implies having the authority or the control to establish the policies of the organization (Cheffins & Bank, 2009). There is no precise data in Mexico when family business groups began, but it can be mentioned that this type of organization began with the industrial revolution in the late nineteenth century (Chavarin, 2011).

## 1. MEXICAN CONTEXT.

In Mexico the context can be understood as a vast majority of family owned corporations with structures known as business groups; these can be identified as a strategy that comes from 19<sup>th</sup> century, which consist in develop a business group through an structured known as market concentration (Chavarín, 2012; Shleifer et al., 2000).

Moreover, this is something common in the world; since 19% of the listed companies in different stock exchanges are controlled by familiar business groups, which seek to obtain the profits of the subsidiaries and in turn to have a control without need of capital contribution (La Porta et al., 1999). Although there may theoretically be disadvantages in family ownership, there are studies that argue that when such structures exist, managers will seek long - term strategies to ensure the wealth of their family (Leff, 1978; Granovetter, 2010; Miller et al., 2008; Minichilli, Corbetta & MacMillan, 2010).



Table 1. The thirteen largest Mexican multinationals in 2015.

Ranking	Companies	Sales (mdd)	Earnings (mdd)	Assets (mdd)	Market Value (mdd)
125	América Móvil	63,700	3,500	85,200	74,500
379	FEMSA	20,900	1,300	25,500	33,800
519	Banorte	8,100	1,100	74,500	16,900
556	Grupo México	9,300	1,800	20,600	23,700
794	Grupo Inbursa	4,000	1,400	26,200	17,700
846	Cemex	15,800	-510	34,900	12,400
1,003	Grupo Televisa	6,000	405	15,800	20,400
1,036	Alfa	17,200	-170	15,800	11,000
1,068	Grupo Bimbo	14,200	287	12,000	14,000
1,163	Liverpool	6,100	583	7,100	16,200
1,419	Grupo Elektra	5,600	551	13,300	6,500
1,446	Grupo Carso	6,200	427	6,200	10,100
1,557	Arca Continental	4,700	489	5,400	10,300

Source: Forbes (2015).

It can also be mentioned that family property exists because there is a conflict between the one who controls the company and the shareholder (Castillo Ponce, 2007). When analyzing business groups in emerging economies, the family establishes a pyramid-owned structure to control its multiple affiliated companies (Almeida & Wolfenzon, 2006; Claessens et al., 2000; La Porta et al., 1999, 2002). In other words, they have a certain percentage of ownership sufficient to exercise control over them, in addition to which business groups are the structure that prevails at the global level (Masulis, Pham & Zein, 2011). Within this scope, it is estimated that by 2015 in Mexico there were thirteen of the 2,000 multinationals with the highest income and market value in the world (Global 2000, cited by Forbes, 2015), of which are part of Mexican family-owned business groups are: América Móvil, Inbursa Group and Carso Group (Slim family); FEMSA (Fernández family); Grupo México (the Mota-Velasco family); Grupo Televisa (Azcárraga family); Alfa (Fernández Garza family); Grupo Bimbo (Servitje family); Liverpool (Suberville family); Grupo Elektra (Salinas family) and Arca Continental (Barragán family), the economic importance for Mexico is high, as can be seen in Table 1, these thirteen companies generated global sales of US \$ 181,800 billion, which is equivalent To 22% of Mexican GDP generated in the fourth quarter of 2015.

## 2. THEORETICAL FRAMEWORK.

Multinational companies are those that generate direct investments abroad, which, control activities of generation of value in these international markets, these corporations have been object of study in different parts of the world, which they have analyzed from industries of commodities like are The industrialization of the oil sector in Chile and steel in India (Bucheli, 2010; Ganguli, 2007), to high technology industries such as TATA (Gaur, 2010); Have also generated studies analyzing their success in countries such as China and India (Carney & Dieleman, 2001); As well as the creation of strategies to diversify its business portfolio to the global level, to take advantage of market failures in emerging countries (Carrera, Mesquita & Perkins Vassolo, 2003; Gaur, 2009; Kumar, Gaur & Pattnaik, 2012). It also deals with this issue from the perspective of transaction costs, strategic management, institutional theory and resource-based theory (Göksen & Üsdiken, 2001; Li, Ramaswamy, & Pettit, 2006). Has served to understand the different strategies that multinational companies have sought in their international expansion, it has also been seen that Latin American multinational companies develop a type of organization called business groups (Sargent & Ghaddar, 2001), and it has also been seen how this faces to market imperfections (Yiu, 2010), but to date, little has been studied of the business and friendship networks generated by such companies.

For the development of the present study it is taken as the basic theories of agency and institutional, the first one analyzes the motivations and behaviors of the agent and the main one (Jensen & Meckling, 1976), this seen as a contract by which one or more people (The principal), designates another person (the agent) to perform some service on his behalf, which involves delegating to the agent some authority for decision making. While the second, it can be seen simply as the rules of the game, which include institutional changes over time which may be formal or informal, which, on the one hand, are laws and standards planned humanely and on the other, are moral norms and culture, of which in both cases determines the behavior of both individuals and companies (North, 1993). For this research is taken as an informal institution the behavior that follow the directors and advisers when creating links with other people from different organizations and different industries.

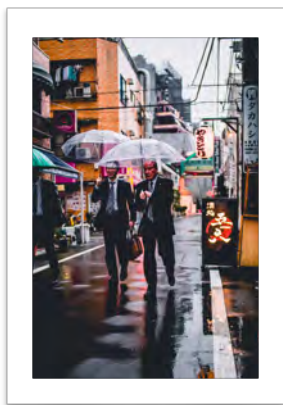
With this, we seek to support the behavior of the agent consistent with the generation of wealth of the principal. It is believed that changes in the structure or process of having a board of directors independent of the control or management of the organization leads to greater efficiency in monitoring and therefore leads to the interests of the principal (Anderson, Melanson & Maly 2007). However the empirical findings show mixed results (Kang, Zardkoohi, 2005), in fact it has been argued that the closeness between the board of directors and the management of the company can enhance the financial benefits, or in other words, the duality between Ownership and control leads to better financial performance (Anderson et al., 2007).

Based on the above, we study an investigation made with information from the Taiwan Stock Exchange (Chung & Luo, 2008), where it finds that business groups are created to reduce agency costs and that in addition these are taken for granted Institutional context. Based on a study done in Canada, however, (Chung & Luo, 2008) mention that when generating such structures there are agency costs for small shareholders and the benefits exist for the controlling family, Financial performance than companies that are totally independent.

In another study by Kuhnén (2009), he mentions that business groups can mitigate agency conflicts by facilitating the transfer of information efficiently, suggesting that the effects of a pyramid structure give better oversight of the board of directors and Increase the possibility of collusion of the same, but does not find relevant that this can improve the results for shareholders.

In emerging economies, external monitoring institutions aimed at the supervision of management are only beginning to be created, this is usually solved with the concentration of ownership and direct management of the company, especially through controlling families (Khanna & Palepu, 1999). Another reason why firms concentrate ownership is for cultural reasons of a society, understanding this as the set of shared beliefs that condition the behavior of individuals (Smircich, 1983). These cultural elements are socially created and, therefore, it cannot be assumed that the corporate governance structure is entirely a product of rationality and the explicit design of individuals. For the above, different studies were analyzed where the term cronyism or cronyism was studied in the corporative as well as its relation with the performance of the company.

It begins by saying that the studies have focused on the crisis that occurred in that continent in the late 1990s, where Dieleman and Sachs (2008), where they analyze business groups in emerging economies, particularly in Indonesia, where Institutional context analyzes the increase in the resources and capacities of a family business group for the friendships generated during the regime of President Suharto, to achieve



this, the company was studied for 20 years through the information available from the Jakarta Stock Exchange and Where 56 interviews were made. On the other hand, in Malaysia, Gul (2006) verified by means of a linear regression and with information from the Worldscoop database that during 1996 to 1998 the fees paid to audit firms increased more in the companies with political ties of the Which did not have, in addition that in 1998 imposed capital controls that in the end turned out to be a financial subsidy that favored the companies with political ties with which the risks derived from the crisis were reduced.

This represented a gain of five billion dollars in the stock market (Johnson & Milton, 2001). In this same line of research, but in China, Allen and Li (2011) analyzed the long-term impact of the recovery on the compensation of managers in the banking sector in China, where through a linear regression they find evidence that The existence of political cronyism in the main four Chinese banks, find the existence of preferential loans, the same happened in Romania where during crisis the companies of nationality of that country had access to preferential loans unlike foreign investors, resulting in low Levels of indebtedness of the former (Valsan, 2005).

This theme of cronyism, not only covers issues of political ties with companies, has also been studied through organizational relationships (, such as Begley and Khatri (2010), who analyze these networks in a context of change Social, where two types of networks identify comrades (clique) and business networks, in addition to two forms of competition, inter and intra net, in each of them it is shown that network competition increases the cronyism that is something natural In family ties, among friends, business partners, but in any case must be analyzed to avoid acts

of corruption, which have caused financial crises such as those in Asia and the United States (Khatri & Tsang, 2006). Also from the business perspective, it can be mentioned that they work in networks and that in this 21st century are quite sophisticated, based on friendship, family ties or business networks (Contractor, Wasserman & Faust, 2006). Similarly, organizational cronyism reflects the reciprocal exchange and is found to be the most important factor for the generation of confidence on the part of the managers.

As a result, it is clear that this issue is broad and can be exploited further, previous research has focused on issues of political friendship (Dieleman & Sachs, 2008; Gul, 2006; Johnson & Milton 2001; Khatri & Tsang, 2006; Contractor, Wasserman & Faust, 2006), but not only cronyism occurs in these spheres is also held in the business or organizational domain. Therefore, the present research aims to increase the knowledge of this subject in a greater extent in the business networks, it is analyzed the general managers and the chairmen of council of the business groups in Mexico the following hypotheses are proposed:

H<sub>1a</sub>: The level of existing relations of the CEO with members of the board of directors is positively related to the performance of the company.

H<sub>1b</sub>: The level of existing relations of the CEO with other organizations is positively related to the performance of the company.

H<sub>1c</sub>: The level of the CEO's existing relationships with other industries is positively related to the company's performance.

H<sub>2a</sub>: The level of existing relations of the chairman of the board of directors with members of the board itself is positively related to the performance of the company.

H<sub>2b</sub>: The level of existing relations of the chairman of the board of directors with other organizations is positively related to the performance of the company.

H<sub>2c</sub>: The level of existing relations of the chairman of the board of directors with other industries is positively related to the performance of the company.

### 3. METHODOLOGY.

To test the hypotheses, we used information from the 143 companies listed on the Mexico Stock Exchange, completing the information with the ISI Emerging Markets and Bloomberg database, of the companies with



information available only 87, since the remaining 56, did not have complete information. The present research is developed with an analysis of variance (ANOVA), this tool seeks to analyze the differences between means of different groups in this case investigates if there are differences between both the directors and the presidents of the companies In the relationships they have with members of the board, with other companies and with companies from other industries.

### 3.1 Variables Measurement.

To measure the dependent variable, as already mentioned, secondary databases were taken, "relations of the director general with board members, with other organizations and other industries" was developed as a continuum and what Bloomberg published as the number of Identified connections exist with board members, connections with different organizations and connections with different industries. In the same way the relations of the chairman of the board of directors were analyzed.

The independent variables were developed through financial indicators such as return on assets (ROA), which is obtained by dividing net profits over total assets; The return on shareholders' equity (ROE), which is obtained by dividing post-tax earnings on the total capital of the shareholders; The net return on sales, which is calculated by dividing earnings after tax on income; The gross profit margin (UOB) is obtained by dividing the income minus the cost of the goods between the income and finally the net profit margin (OU) which is calculated by dividing the profit after tax between the income.

## 4. RESULTS.

This section analyzes the relations of both the CEO and the CEO of the company and in the first case analyzes the results generated between the CEO and the board members generates a good performance of the company by throwing the information that Of advice shedding the indicators return on assets (ROA), return on equity of the shareholders (ROE); Which can not be significant with the F statistic; (ROS) results in a .10 level of significance, while the gross profit margin (UOB) and net profit margin (UO) indicators result in a significance level of .01, In addition it can be seen that the return on sales is the one that has the most impact by the sum of squares of inter-groups (Table 2), in this case you can see the ties in the intra or intra-organizational relationships can generate A better performance of the company (Begley & Khatri, 2010).

Table 2. One way ANOVA of the relations of the general director with members of the council

		Suma de cuadrados	gl	Media cuadrática	F	Sig.
ROA	Inter-grupos	4.711	44	.107	.267	1.000
	Intra-grupos	16.445	41	.401		
	Total	21.156	85			
ROE	Inter-grupos	1.720	44	.039	1.446	.116
	Intra-grupos	1.136	42	.027		
	Total	2.856	86			
ROS	Inter-grupos	78.669	44	1.788	1.976	.015
	Intra-grupos	37.101	41	.905		
	Total	115.769	85			
UOB	Inter-grupos	32.741	44	.744	9.323	.000
	Intra-grupos	3.352	42	.080		
	Total	36.093	86			
UO	Inter-grupos	70.110	44	1.593	48.564	.000
	Intra-grupos	1.378	42	.033		
	Total	71.488	86			

Table 3. One way ANOVA of the relations of the director general with other organizations

		Suma de cuadrados	gl	Media cuadrática	F	Sig.
ROA	Inter-grupos	.413	9	.046	.168	.997
	Intra-grupos	20.743	76	.273		
	Total	21.156	85			
ROE	Inter-grupos	.069	9	.008	.211	.992
	Intra-grupos	2.787	77	.036		
	Total	2.856	86			
ROS	Inter-grupos	4.198	9	.466	.318	.967
	Intra-grupos	111.571	76	1.468		
	Total	115.769	85			
UOB	Inter-grupos	1.011	9	.112	.247	.986
	Intra-grupos	35.082	77	.456		
	Total	36.093	86			
UO	Inter-grupos	1.655	9	.184	.203	.993
	Intra-grupos	69.832	77	.907		
	Total	71.488	86			

When analyzing the relations of the director general with other organizations and other industries, ie the interorganizational part, you can see that the return on sales has a greater impact on the performance of the company, cannot be said to exist a relationship Significant, since in Tables 3 and 4 a very low value can be seen in the F statistic, so it can be said that there is no relation between the company's performance and the relations that the CEO has with other organizations as with others Industries.

Tabla 4. ANOVA de un factor de las relaciones del director general con otras industrias

		Suma de cuadrados	gl	Media cuadrática	F	Sig.
ROA	Inter-grupos	1.030	9	.114	.432	.914
	Intra-grupos	20.126	76	.265		
	Total	21.156	85			
ROE	Inter-grupos	.283	9	.031	.942	.494
	Intra-grupos	2.573	77	.033		
	Total	2.856	86			
ROS	Inter-grupos	11.477	9	1.275	.929	.505
	Intra-grupos	104.292	76	1.372		
	Total	115.769	85			
UOB	Inter-grupos	2.128	9	.236	.536	.844
	Intra-grupos	33.965	77	.441		
	Total	36.093	86			
UO	Inter-grupos	5.630	9	.626	.731	.679
	Intra-grupos	65.858	77	.855		
	Total	71.488	86			

The following analysis was made of the chairman's relationship with other directors, other companies, and other industries, it is appreciated that there is no level of significance to say that there is an impact on the chairperson's relations with other counselors in the Generating a good financial performance of the company (Table 5). However, observing the levels of significance of the board chairman's relationships with other companies and other industries identifies that the financial indicator called return on assets has a significance level of 0.05 and .010 respectively, but not the same In the other dependent variables, where we can see that there is no relation to the independent variables, with the above it

can be said that relations based on friendship or business networks are quite sophisticated for this first analysis and a study is needed where Reflects the reciprocal exchange that may exist both inside and outside the company (Contractor, Wasserman, Faust, 2006).

Table 5. One way ANOVA of the chairperson's relations with other counselors

		Suma de cuadrados	gl	Media cuadrática	F	Sig.
ROA	Inter-grupos	10.322	45	.229	.847	.707
	Intra-grupos	10.834	40	.271		
	Total	21.156	85			
ROE	Inter-grupos	1.624	45	.036	1.201	.277
	Intra-grupos	1.232	41	.030		
	Total	2.856	86			
ROS	Inter-grupos	29.393	45	.653	.302	1.000
	Intra-grupos	86.376	40	2.159		
	Total	115.769	85			
UOB	Inter-grupos	9.199	45	.204	.312	1.000
	Intra-grupos	26.894	41	.656		
	Total	36.093	86			
UO	Inter-grupos	15.656	45	.348	.255	1.000
	Intra-grupos	55.832	41	1.362		
	Total	71.488	86			

Table 6. One Way ANOVA of the relations of the president of the council with other companies

		Suma de cuadrados	gl	Media cuadrática	F	Sig.
ROA	Inter-grupos	6.849	11	.623	3.220	.001
	Intra-grupos	14.307	74	.193		
	Total	21.156	85			
ROE	Inter-grupos	.245	11	.022	.640	.789
	Intra-grupos	2.611	75	.035		
	Total	2.856	86			
ROS	Inter-grupos	11.842	11	1.077	.767	.672
	Intra-grupos	103.927	74	1.404		
	Total	115.769	85			
UOB	Inter-grupos	1.717	11	.156	.341	.974
	Intra-grupos	34.377	75	.458		
	Total	36.093	86			
UO	Inter-grupos	2.477	11	.225	.245	.993
	Intra-grupos	69.011	75	.920		
	Total	71.488	86			

Tabla 7. One Way ANOVA of a factor of relations of the president of the council of other industries

		Suma de cuadrados	gl	Media cuadrática	F	Sig.
ROA	Inter-grupos	6.928	15	.462	2.272	.011
	Intra-grupos	14.228	70	.203		
	Total	21.156	85			
ROE	Inter-grupos	.524	15	.035	1.065	.404
	Intra-grupos	2.331	71	.033		
	Total	2.856	86			
ROS	Inter-grupos	11.855	15	.790	.532	.914
	Intra-grupos	103.914	70	1.484		
	Total	115.769	85			
UOB	Inter-grupos	3.947	15	.263	.581	.880
	Intra-grupos	32.146	71	.453		
	Total	36.093	86			
UO	Inter-grupos	4.752	15	.317	.337	.989
	Intra-grupos	66.736	71	.940		
	Total	71.488	86			

The results show a contribution to understand the behavior of networks of friendship generated by managers of business groups in Mexico and it can be seen that organizational relationships in the form of friendship is a way to generate greater entrepreneurial skills that benefits them to generate a Positive effect on performance (Begley & Khatri, 2010; Contractor, Wasserman & Faust, 2006).

## CONCLUSIONS

Therefore, within the findings of the present investigation it is considered that the one part of the performance of the company is associated with the relations that have the director general with other members of the council, which contradicts the theory of the agency, which Mentions that the agent (director of the company) must be an independent person so that it can be monitored by the members of the board, the previous thing can be logical if one takes into account that the majority of the companies studied are of familiar origin and is Something common that arise this type of relations.

So you can check the hypothesis 1a, but not the 1b and 1c. With respect to hypothesis 2a, 2b and 2c, it can be tested only partially because it only seems to have relations with the performance of the assets, which can be logical when analyzing that one of the most important functions of the president of the council is to help To establish the investment objectives of the company and to see how the performance generated by the amount of relationships that such person achieves is an interesting finding in this research.

One of the limitations of the present investigation is that it would be necessary to complete the sample with all the companies of the Mexican Stock Exchange to analyze the behavior of the companies that are not part of business groups. Issue in terms of investment decisions in different countries where managers have generated friendly relations and can also be analyzed in different institutional contexts and longitudinally over time.

## REFERENCES

- Adler, P. S., & Kwon, S. W. (2002). Social capital: Prospects for a new concept. *Academy of management review*, 27(1), 17-40.
- Allen, L., & Li, G. (2011). Clawbacks and Cronyism: Evidence from China, *Financial Management*, Fall, 733 – 756.
- Almeida, H. V., & Wolfenzon, D. (2006). A theory of pyramidal ownership and family business groups. *The Journal of Finance*, 61(6), 2637-2680.
- Anderson, D. W., Melanson, S. J., & Maly, J. (2007). The Evolution of Corporate Governance: power redistribution brings boards to life. *Corporate Governance: An International Review*, 15(5), 780-797.
- Barnett, A., Yandle, B., & Naufal, G. (2013). Regulation, trust, and cronyism in Middle Eastern societies: The simple economics of “wasta”. *The Journal of Socio-Economics*, 44, 41-46.
- Begley, T. M., Khatri, N., & Tsang, E. W. (2010). Networks and cronyism: A social exchange analysis. *Asia Pacific Journal of Management*, 27(2), 281-297.
- Borgatti, S. P., & Foster, P. C. (2003). The network paradigm in organizational research: A review and typology. *Journal of management*, 29(6), 991-1013.
- Brass, D. J., Galaskiewicz, J., Greve, H. R., & Tsai, W. (2004). Taking stock of networks and organizations: A multilevel perspective. *Academy of management journal*, 47(6), 795-817.

- Bucheli, M. (2010). Multinational corporations, business groups, and economic nationalism: standard oil (New Jersey), Royal Dutch-Shell, and energy politics in Chile 1913-2005. *Enterprise and society*, 11(02), 350-399.
- Carney, M. (2008). The many futures of Asian business groups. *Asia Pacific Journal of Management*, 25(4), 595-613.
- Carney, M., & Dieleman, M. (2011). Indonesia's missing multinationals: Business groups and outward direct investment. *Bulletin of Indonesian Economic Studies*, 47(1), 105-126.
- Carney, M., Gedajlovic, E. R., Heugens, P. P., Van Essen, M., & Van Oosterhout, J. H. (2011). Business group affiliation, performance, context, and strategy: A meta-analysis. *Academy of Management Journal*, 54(3), 437-460.
- Carrera, A., Mesquita, L., Perkins, G., & Vassolo, R., (2003), Business groups and their corporate strategies on the Argentine roller coaster of competitive and anticompetitive shocks, *Accademy of Management Executive*, 17(3), 32-44.
- Castillo, R. A. (2007). Entre Familia y Amigos: La Elección de la Estructura de Propiedad Corporativa. *Estudios Económicos*, 22(1), 3 – 18.
- Chacar, A., & Vissa, B. (2005). Are emerging economies less efficient? Performance persistence and the impact of business group affiliation. *Strategic Management Journal*, 26(10), 933-946.
- Chang, J. J., & Shin, H. H. (2006). Governance system effectiveness following the crisis: The case of Korean business group headquarters. *Corporate governance: an international review*, 14(2), 85-97.
- Chavarin Rodriguez, R. (2011). Los grupos económicos en México a partir de una tipología de arquitectura y gobiernos corporativos: Una revisión y sus explicaciones teóricas. *El Trimestre Económico*, (LXXVIII)1, 193 – 234.
- Chavarín Rodríguez, R. (2012). Bancos ligados a grupos económicos en México y concentración de mercado en la banca comercial. *Paradigma económico*, 4(1), 5 – 26.
- Cheffins, B., & Bank, S. (2009). Is Berle and Means really a myth?. *Business History Review*, (83)3, 443 – 474.
- Chen, M. J., & Miller, D. (2011). The relational perspective as a business mindset: Managerial implications for East and West. *The Academy of Management Perspectives*, 25(3), 6-18.

- Chung, C. N., & Luo, X. (2008). Institutional Logics or Agency Costs: The Influence of Corporate Governance Models on Business Group Restructuring in Emerging Economies, *Organization Science*, 19(5), pp. 766 – 784. doi: 10.1287/orsc/1070.0342
- Claessens, S., & Fan, J. P. (2002). Corporate governance in Asia: A survey. *International Review of finance*, 3(2), 71-103.
- Contractor, N. S., Wasserman, S., & Faust, K. (2006). Testing Multitheoretical, Multilevel Hypotheses About Organizational Networks: An Analytic Framework And Empirical Example, *Academy Of Management Review*, 31(3), Pp. 681-703.
- Dieleman, M., & Sachs, W. (2008). Coevolution of Institutions and Corporations in Emerging Economies: How the Salim Group Morphed into an Institution of Suharto's Crony Regime. *Journal of Management Studies*, 45(30), 1275-1300.
- Drory, A., & Romm, T. (1990). The Definition of Organizational Politics: A Review, *Human Relations*, 43, 1133-1154.
- Forbes (2015). Las 13 empresas mexicanas globales más grandes, *Revista Forbes México*, consultado el 1 de junio de 2015 de <http://www.forbes.com.mx/las-13-empresas-mexicanas-globales-mas-grandes/>
- Gaur, A., & Kumar, V. (2009). International Diversification, Business Group Affiliation and Firm Performance: Empirical Evidence from India, *British Journal of Management*, 20, 172-186. DOI: 10.1111/j.1467-8551.2007.00558.x
- Gaur, J. (2010). Financial Performance Measures of Business Group Companies: A Study of Indian Non-Metallic Mineral Products Industries, *The IUP Journal of Business Strategy*, VII(4), 45-53.
- Göksen N., & Üsdiken B. (2001). Uniformity and Diversity in Turkish Business Groups: Effects of Scale and Time of Founding, *British Journal of Management*, 12, 325-340.
- Goto, A. (1982). Business groups in a market economy. *European economic review*, 19(1), 53-70.
- Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American journal of sociology*, 91(3), 481-510.
- Granovetter, M. (2010). 19 Business Groups and Social Organization. *The handbook of economic sociology*, 429.



- Gul, F. A. (2006) Auditors' Response to Political Connections and Cronyism in Malaysia, *Journal of Accounting Research*, 44(5), 931 - 963 DOI: 10.1111/j.1475-679X.2006.00220.x
- Inkpen, A. C., & Tsang, E. W. (2005). Social capital, networks, and knowledge transfer. *Academy of management review*, 30(1), 146-165.
- Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of financial economics*, 3(4), 305-360.
- Johnson, S., & Mitton, T. (2001). Cronyism and controls: Evidence from Malaysia, NBER Working paper series. No. 8521, 1 - 16.
- Kang, E., & Zardkoohi, A. (2005). Board Leadership Structure and Firm Performance. *Corporate Governance: An International Review*, 13(6), 785 - 799.
- Keister, L. A. (1998). Engineering Growth: Business Group Structure and Firm Performance in China's Transition Economy 1. *American journal of sociology*, 104(2), 404-440.
- Keles, H. N., Özkan, T. K., & Bezirci, M. (2011). A study on the effects of nepotism, favoritism and cronyism on organizational trust in the auditing process in family businesses in Turkey. *The International Business & Economics Research Journal*, 10(9), 9.
- Khanna, T., & Palepu, K. (1999). Emerging Market Business Groups, Foreign Investors, and Corporate Governance. National Bureau of Economic Research. Working Paper, 6955, consultado de: <http://www.nber.org/papers/w6955>
- Khatri N., Tsang, E. W. K., & Begley, T. M. (2006). Cronyism: a cross-cultural analysis, *Journal of International Business Studies*, 37, 61 - 75.
- Khatri, N., & Tsang, E. W. K. (2003). Antecedents and Consequences of Cronyism in Organizations, *Journal of Business Ethics*, 43, 289 - 303.
- Kuhnen, C. (2009). Business Networks, Corporate Governance, and Contracting in the Mutual Fund Industry, *The Journal of Finance*, LXIV(5), pp. 2185 - 2220.
- La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (1999). "Corporate Ownership around the World", *The Journal of Finance*, (LIV) 2, 471 - 517.
- Leff, N. H. (1978). Industrial organization and entrepreneurship in the developing countries: The economic groups. *Economic development and cultural change*, 26(4), 661-675.

- Li, M., Ramaswamy, K., & Pettit, P. (2006). Business groups and market failures: A focus on vertical and horizontal strategies, *Asia Pacific Journal of Management*, 23, 439–452. DOI 10.1007/s10490-006-9016-1.
- Mathews, J. A. (1998). Fashioning a new Korean model out of the crisis: the rebuilding of institutional capabilities. *Cambridge Journal of Economics*, 22(6), 747-759.
- Miller, D., Breton-Miller, L., & Scholnick, B. (2008). Stewardship vs. stagnation: An empirical comparison of small family and non-family businesses. *Journal of Management Studies*, 45(1), 51-78.
- Minichilli, A., Corbetta, G., & MacMillan, I. C. (2010). Top management teams in family controlled companies: ‘familiness’, ‘faultlines’, and their impact on financial performance. *Journal of Management Studies*, 47(2), 205-222.
- North, D. (1993). *Instituciones, cambio institucional y desempeño económico*. México, DF: Fondo de Cultura Económica.
- Peng, Y-S., Yang, K-P., & Liang, Ch. (2011). The Learning Effect on Business Groups’ Subsequent Foreign Entry Decisions into Transitional Economies, *Asia Pacific Management Review*, 16(1) 1-21.
- Shleifer, A., Vishny, R. W., Porta, R., & Lopez-de-Silanes, F. (2000). “Investor protection and corporate governance”, *Journal of Financial Economics*. 58(1-2), 3-27.
- Smircich, L. (1983). Concepts of Culture and Organizational Analysis. *Administrative Science Quarterly*, 28, 339 – 358.
- Turhan, M. (2014). Organizational Cronyism: A Scale Development and Validation from the Perspective of Teachers, *Journal of Business Ethics*, 295 – 308.
- Valsan, C. (2005). The Determinants of Borrowing by Newly Exchange-listed Firms in Romania: When Adverse Selection Meets Cronyism, *Post-Communist Economies*, 17(1), 109 – 123.
- Yiu, D. (2010). Multinational Advantages of Chinese Business Groups: A Theoretical Exploration. *Management and Organization Review*, 7(2), 249–277. DOI: 10.1111/j.1740-8784.2010.00210.x
- Yiu, D., Bruton, G. D., & Lu, Y. (2005). Understanding business group performance in an emerging economy: Acquiring resources and capabilities in order to prosper. *Journal of Management Studies*, 42(1), 183-206.



---

# Chapter 4

---



## Financial Cost of the Public University Pension Plan

*By Denise Gómez-Hernández and Ignacio Almaraz-Rodríguez*



# Financial Cost of the Public University Pension Plan

Denise Gómez-Hernández  
Ignacio Almaraz-Rodríguez  
Universidad de Querétaro, México

## INTRODUCTION

In Mexico, the principal mandatory pension system started to operate as a Defined Benefit (DB) in 1973. However, since 1997 a switch from Defined Benefit to Defined Contribution (DC) with individual accounts managed by financial institutions, such as banks or insurance companies, was made. This DC system is still opened to new members, whereas the DB pension one is closed. As of today, the Mexican pension system consists mainly of 4 pillars: the non-contributory, the public mandatory, the private mandatory and the voluntary (CONSAR, 2015, p. 15). The first pillar (called the pillar 0) consists on a universal basic pension financed by the government with a minimum pension guarantee, the second (pillar 1) consists on a compulsory plan financed exclusively by the government, financed with contributions or with both. This pillar is mandatory for the individuals working on the public sector with a pension plan. The third pillar (pillar 2) is also mandatory but financed by contributions, then it is considered a funded plan. The fourth pillar (pillar 3) is a voluntary one which consists on voluntary additional contributions or private pension plans bought to insurance companies.

The pillar 2 consists of two different pension schemes. That is, individuals entering to formal jobs in Mexico from July 1997 to date (referred to the current pensions law called IMSS-97), are automatically credited with an individual account managed by a financial institution, in order to save for retirement. In contrast, individuals who entered to



formal jobs before July 1997, have the choice of a DB pension under the IMSS-73, which is of a DB kind and consists on a pension at retirement depending on the final salary of the worker or individual.

The chronology of the mandatory pension plans in Mexico is shown in figure 1. Summarizing, the first public mandatory system in Mexico started in 1960 with the Institute for Social Security and Services for State Workers (ISSSTE) operating under pillar 1. In 1973, the second public mandatory system started to operate also under pillar 1 with the Institute for the Mexican Social Security (IMSS). These two main institutions coexists in Mexico to provide for social security to all Mexican employees with the difference that ISSSTE relates to state workers while IMSS relates to workers in non-state institutions or private sector employees. In 1992, the system retirement savings (SAR) was created in order to regulate the new mandatory pension system in Mexico related to IMSS, also in 1994 the national commission for the retirement savings system (CONSAR) was created to regulate the SAR. In 1997, the pension system for private sector employees was amended from a pay-as-you-go scheme to a defined contribution structure based on individual accounts managed by private institutions called AFORES (pension funds management companies). In 2007, new public sector employees affiliated to ISSSTE were incorporated to the individual accounts pension system.

Figure 1. Chronology of mandatory pension plans in Mexico.



Source: Authors' contribution with data from OECD (2015)

As of today, AFORES are the institutions in charge of the management of the employees' mandatory pension savings who started to work after 1997 (IMSS) or 2007 (ISSSTE). These AFORES, through the SIEFORES, invest the funds with the investment regime defined by CONSAR. Another important date is 2008 in which the employees' pension funds from the

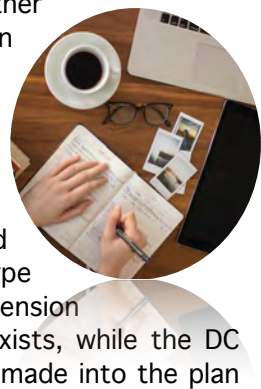
Federal Commission of Electricity (CFE) started to operate under the AFORES. This kind of DC pension scheme has the advantage of making the financing of benefits explicit but leaves the cost of the benefits undefined, requiring that the falling of equity prices and declining annuity rates a larger DC fund to provide a decent retirement income (Foster, 2007).

The objective of this work is to show a numerical example of the financial cost the pension plans operating under pillar 1 represent. Specifically, a DB plan in a public university in Mexico is described as well as the total actuarial liabilities, the annual cash flows for the payment of pensions and the dependency ratio will be calculated assuming a quantitative methodology. Section 2 show then, the description of this example, section 3 the methodology assumed and section 4 the conclusions.

## 1. PRIVATE PENSIONS: AN EXAMPLE OF A PUBLIC UNIVERSITY

As of September 2016; 2 thousand private pension plans registered existed in Mexico (Hernández, 2016). According to CONSAR, 1.4 million of employees are covered by these plans, which represent more than 400 thousand of millions of pesos and 92% of these are opened to new members. These plans are considered to be complementary to the mandatory pension plan in Mexico (Hernández, 2016). The private pension plans can be attractive for both employee and employer if their objectives are common (Turner, 2011). That is, if the employer offers a private pension plan as a way of decreasing the employee rotation and consequently increase profits. On the other hand, if the employee is credited with a private pension plan, the financial situation at retirement is solved.

As mentioned before, under the Mexican pillar 1, individuals working on the public sector can benefited from a pension when the public institution offers them. These kinds of pensions are considered to be private plans and there are 3 types: defined contribution (DC), defined benefit (DB) or a mixed type and can be a funded or an unfunded scheme. A DB pension plan is where a fixed rule to calculate the benefits exists, while the DC pension plan a fixed rule to calculate the contribution made into the plan





exists (Booth et al., 2005). The funding of a pension plan refers to the frequency on the payments of the contributions to the plan.

There is a specific case, the pension plans offered by public universities. In Mexico, all of them operate under a DB type, from a total of 12 different pension plans compared, see table 1. From this comparison, it is also found that the average compulsory retirement age is 63 with an average of 27 years of service. These pension plans are generous, in the sense that the actual mandatory pension plan in Mexico requires 65 years of age to retire and 40 years of service suggested to reach only a replacement rate of 50% (OECD, 2015, p. 4). That means, the individuals who are credited with this kind of pension plan need to work 13 years more only to obtain half of the pension than with a public university pension plan. Also, compared with private pension plans in the UK, DB schemes typically operate with a maximum income of pension of 2/3 of final salary in retirement (Foster, 2007), in Mexico 100% (or 3/3) of final salary is a much better situation.

Table 1. Pension plan characteristics from 12 public universities.

	%
Defined benefit financed with contributions	100
Lump sum at retirement	33
Replacement rate of 100% of the salary (when no entitlement to other pension exists)	42

Source: Authors' elaboration with data from 12 public university's pension plans.

In order to give a specific example of a DB pension plan, the details are described in table 2. The plan is then, as mentioned before, considered a generous one compared with the actual mandatory pension system but also with others in the study. The plan was closed to new members in 2008, due to the high deficit it represents to the university and the public finances. Also, this plan was created to complement the pension received under the mandatory DB system. That is, the employees receiving a pension from the university also receive a pension from the current mandatory plan, so the university pension have to complement to receive in total 100% of the final salary. For example, if an employee receives a replacement rate of 70% under the mandatory plan, the university will complement the pension to receive in total 100%. That is the main objective of the majority of pension plans offered by public universities in Mexico. If we compare this situation with the one in the

United States, Clark and Craig (2011) showed that teachers reach an average replacement rate of 60% with 30 years of service. Situation that is much less generous than our specific example in Mexico as the replacement rate reached is 100% (not to mention that this is comparable with the situation in the UK mentioned before).

Table 2. An example of a DB pension plan: Mexican public university.

Pension plan type	Defined benefit scheme (coexisting with the DB pension under the IMSS-73 law*)
Retirement age	60 years old~
Years of service	30 years
Total of monthly payments per year included in the pension	16+
Contributions to the pension fund	The university contributes twice the employee's contribution as a percentage of the salary^
Ancillary benefits	65% of the pension to the widow or widower and 30% to each child under 18 years old-

Notes:

\*See section 1.

~As of 2015, the retirement age is 57 years old which is going to increase 6 months each year until 60 years old in 2021.

+The pension is calculated according to the total annual salary received by the employee, which consists of 12 monthly payments plus an annual bonus of 4 months as part of Christmas and vacations bonuses (in Spanish it is called "Aguinaldo" and "prima vacacional").

^There is a maximum percentage of 16%.

-Child under 25 if studying. Both percentages do not have to exceed 100%.

Source: Authors' elaboration with data from public university's pension plan.

Any pension plan has to be regulated by the government actual rules. In Mexico, private pension plans have to be registered at CONSAR. However, although pension plans from public universities are considered of a private type, such plans are not registered. These, instead, are regulated by the institution itself in which these are designed. Compared with the United States, as of 2011, there were 13 states whose teachers were outside the United States Social Security system: Alaska, California, Colorado, Connecticut, Illinois, Kentucky, Louisiana, Maine, Massachusetts, Missouri, Nevada, Ohio and Texas. These retirement plans for teachers not covered by Social Security are more generous than the plans covering teachers who are participating in Social Security (Clark and Craig, 2011). Also, defined benefit plans remain the dominant type of retirement plan for teachers with pension benefit formulas often rather complex, with the

benefit varying by age, years of service, earnings, and coverage by Social Security (Clark and Craig, 2011, p. 105). A similar situation is found in Mexico, the pension plan rules of public universities are complex and sometimes quite difficult to understand. Also, these pension plan rules are not easily reached, as most of the times are not published or found at the internet.

A private pension plan also has a cost, which is determined by an actuary and depends on the assumptions that this makes. Then, an annual cost can be calculated assuming actuarial methods which will depend on certain assumptions such as salary increases, investment income, mortality and employee rotation, among others (Aitken, 1996). There are many research works about the relationship between benefits and costs (Hicks, 1965; Barth, Beaver & Landsman, 1992; Godwin, Goldberg & Duchac, 1996; Gruber & Wise, 2000; Coronado & Sharpe, 2003; Jin, Merton & Bodie, 2006; Bikker, & De Dreu, 2009). The actual experience on the plan also has an impact on the cost of the plan. Then, for an employer with low income or profit this uncertainty on the plan cost is not desirable (Aitken, 1996). To calculate this plan cost there exists pension plan administration software; however, in Mexico, this calculation needs to be validated by an actuary certified by the national actuaries association (CONAC). The actuarial liabilities represent this plan cost as it is the amount to make provision to the benefits to be paid to the employee at retirement (Aitken, 1996).

Section 3 shows the methodology to calculate the actuarial liability for the pension plan described in table 2, in order to give an overview of the financial burden that this represents. The annual cash flows will be also shown to analyze the annual payments that the university has to pay to actual pensions.

## 2. METHODOLOGY.

The methodology followed in this work is of a quantitative form, then, actuarial methods are used to reach the main objective. In any pension plan of the defined benefit type the liabilities are represented for the institution holding the plan. In Mexico, for accounting purposes the pension plans represent an annual cost which is calculated using actuarial formulas. According to Blake (2006, p. 194), the majority of the defined benefit actuarial liabilities are calculated using a specific method called “the projected unit method”. However, for the study presented in this

work, a formula related with an actuarial present value of the pension amount is used. See formula (1) and (2).

$$AL_t^a = v^{r-x+t} {}_{r-x+t}p_x [S_x(1+i)^{r-x+t}] \ddot{a}_{r+t} \quad (1)$$

$r$  = retirement age when the employee has reaching 30 years of service

$x$  = current age

$i$  = salary increment rate

$$v^{r-x+t} = (1+j)^{x-r-t}$$

$j$  = discount rate

${}_{r-x+t}p_x$  = probability of surviving till retirement age

$S_x$  = Salary at age  $x$

$\ddot{a}_{r+t}$  = whole life annuity paid in advanced representing the payment for pension at age  $r+t$

$$AL_t^b = v^t {}_t p_x [P_t \ddot{a}_{x+t}] \quad (2)$$

Where:

$AL_t^b$  = Actuarial liabilities from retirees

$P_t$  = Pension in payment at time  $t$

In order to calculate the actuarial liabilities for this particular pension plan example, the following assumptions are made:

- All employees retire with a 100% of their salary
- All employees retire immediately after 30 years of service
- An annual increase on salary of 4.5%
- 16 monthly salaries are considered annually to calculate the pension amount, according to the rules of the plan.
- Mexican mortality rates according to the National Commission on Insurance (CNSF) in Mexico.

- All employees are married and with no children. For female employees, it is assumed that they are married with a person 2 years older and for male employees with a person 2 years younger.

Annual cash flows are also calculated, in order to analyze the annual pension payments from the institution. These are calculated separately for active members who are entitled for a pension in that particular year and for actual retirees. Formula (3) and (4) show the calculations to obtain cash flows for active members and retirees, respectively.

$$CF_t^a = r_{-x+t} p_x [S_x (1+i)^{r-x+t}] \quad (3)$$

$$CF_t^b = {}_t p_x P_t \quad (4)$$

Where:

$CF_t^a$  = cash flow at time  $t$  of active members

$CF_t^b$  = cash flow at time  $t$  of retirees

The assumptions to calculate cash flows are the same as previous ones with the following differences:

- No widow or widower is assumed, only payments to pensioner.
- All employees are entitled with a pension from IMSS. That is, the cash flows represent only complementary payments to reach 100% of the salary.

The results for this study are presented in the next section. The data was obtained from the institution itself and the specific characteristics used in the analysis are: gender, actual age, faculty, total salary and years of service. Although this is a specific study case, the situation of most universities in the country is similar.

### 3. RESULTS.

In order to show the financial cost the example of a private pension plan described in section 2 represent, a general overview of the current situation of the 2204 employees credited with the pension described in table 2, is first shown in table 3. To know the general characteristics of the employees credited with a specific pension plan is important, in order to understand the financial cost this represent. Therefore; first note that there is a high standard deviation between salaries, due to the difference

between the minimum and the maximum annual salary. This is because of the difference on the employee contract within the institution, that is, some employees work under part-time contracts while others are full-time employees. Another important aspect is that the employees gender is balanced with almost half males and half females. Finally, it is observed that the average age of the total employees at this institution is 47 years old.

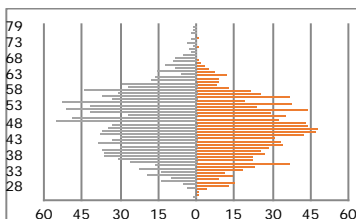
Table 3. Current situation of the employees at the university.

Gender	55% males, 45% females
Average age	47
Monthly average salary	\$14,574
Minimum monthly salary	\$329
Maximum monthly salary	\$108,918

Source: Authors' elaboration with data from public university's employees.

The financial cost represented by the actuarial liabilities in pension plans, depends greatly on the demographic situation of the university's employees, which is shown in figure 2. The orange bars represent total number of women and the grey bars total number of men. The y-axis represents the age and the x-axis the number of employees. When looking at the results, it can be seen that the average age is 47 and that at this age there are more men than women. Also that the minimum age found is 22 and the maximum 79. The maximum number of women are found at age 46 and for men 48. The population at this university is relatively young.

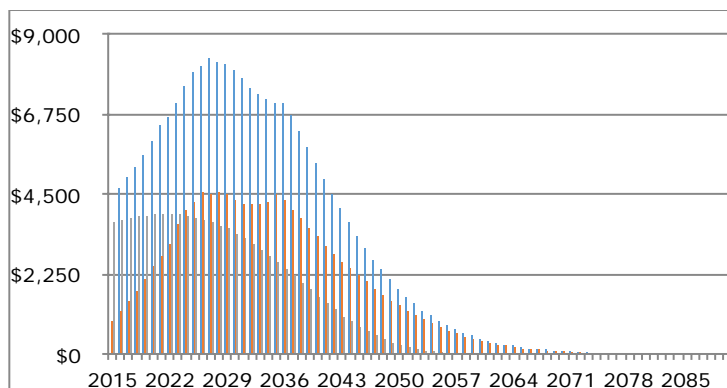
Figure 2. Population pyramid of the university's employees.



Source: Authors' elaboration with data from public university's employees.

The total actuarial liabilities for this pension plan are calculated under the previous assumptions and using formula (1) and (2). The results are shown in figure 3. All values in millions of Mexican pesos, the blue bars represent the total actuarial liabilities (current employees and retirees), the red bars represent the actuarial liabilities for current employees and the grey bars for retirees. From the results, in 2027 the actuarial liabilities reach its maximum value with 8,341 millions of Mexican pesos and these will be extinguished in 2087 because no more retirees will exist. Also, in 2026 a maximum total actuarial liability reaches 4,500 million of pesos for current employees and 4,000 millions of Mexican pesos in 2021.

Figure 3. Total actuarial liabilities.



Note: The blue bars represent the total actuarial liabilities for all current employees and retirees. The red bars represent the total actuarial liabilities for only the current employees and the grey bars for retirees.

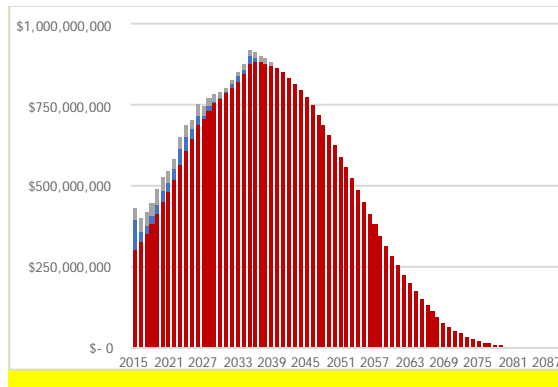
Source: Authors' elaboration.

On the other hand, considering that the university has a total financial budget of \$1,500 million of pesos per year, this will not be sufficient to cover the pension expenses shown in figure 3. Then, it is estimated that when the maximum is reached in 2027 the university will have no sufficient funds to operate, which will be the bankruptcy of the institution. It is important also to show the annual pension cash flows, in order to analyze the annual payments, the pension plan represent. These are shown in figure 4. The red bars represent the cash flows for total

pensions paid at that particular year, the blue bars represent the lump sum received by all employees that retire at that particular year (seen as an ancillary benefit) and the grey bars represent the university payments at IMSS for the total employees entitled to retirement because of years of service but that have not reached the mandatory retirement age.

From the results, in 2027 the cash flows for the retirees reach its maximum with 300 million of pesos. In 2035, the active members' annual payments reach its maximum with 600 million of pesos. Finally, the maximum total annual payment is reached in 2035 with 900 million pesos. It is also found that cash flows will be extinguished in 2089, as no other retirement will occur. A similar situation is found at most of the public universities in Mexico that designed pension plans in the past. Some of them, have already closed their plans to new members because of the high financial cost this represents. The total actuarial liabilities for public universities in Mexico represent 1,000,000 million pesos.

Figure 4. Cash flows as a total of actuarial liabilities (current employees and retirees)



Source: Authors' elaboration.

Another interesting figure from this study is the so called “dependency ratio” defined as “... the ratio of the number of beneficiaries to the number of contributors; this is usually approximately the same as the ratio of the number of pensioners to the number of active members (Z. Khorasane, class notes, March, 2004)”. Then, if we assume that this university's pension plan is unfunded, the active members would have to pay the total pensions of the retirees. The previous mandatory pension



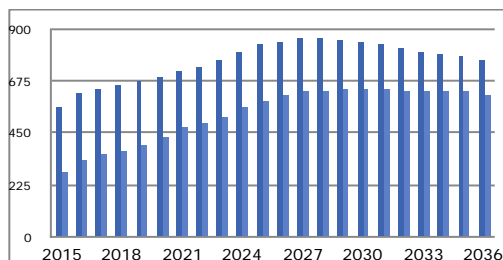
plan in Mexico, currently closed to new members, operated as of this type. The dependency ratio is calculated under formula (5).

$$\text{Dependency Ratio} = \frac{\text{number of pensioners}}{\text{number of active members}} \quad (5)$$

As of 2015, the university dependency ratio was 0.7 but by 2036 it is projected to be 86. That is, at the moment there is 1 active member per 0.7 pensioner and in 2036 there will be 1 active member per 86 pensioners. Under this scenario, in order to finance the pension amount, in 2015 the active members would have to contribute 70% of their salaries and in 2036 would have to be 8600%. This means that the sole contributions are not sufficient to cover the expenses of this plan. It is necessary to find other sources to finance this deficit.

The projected number of retirees is also calculated and shown in figure 5 for this particular case. The dark blue bars show the number of males retiring and the light blue bars the number of women. The results show that by 2027 the majority of the active members will retire (860 males and 629 females). This is consistent with our previous result where it was found that by this date the bankruptcy of the institution will occur.

Figure 5. Projected number of retirees per year



Source: Authors' elaboration.

We can also see from these results that the number of pensioners is increasing until 2027 and after 2036 no more retirements will occur. This is for both males and females. It is worth to remember that until 2089 the pensions in payment for these retirees will be extinguished.

## CONCLUSIONS AND DISCUSSION

The 12 pension plans from public universities analyzed in this work showed to be generous as the average retirement age is 63 with an average of 27 years of service, compared with the actual mandatory pension plan in Mexico which requires 65 years of age to retire. Also, that under the actual mandatory service 40 years of service are suggested to reach only a replacement rate of 50%, which is much lower than 100% under the public universities pension plans analyzed.

A specific case of public university pension plan was analyzed and some characteristics from this are a mandatory retirement age of 60 years old, 30 years of service, 16 monthly salaries to calculate the annual pension, a maximum contribution of 16% to the fund, 65% of pension to the widow or widower and 30% to each child under 18 years old (without exceeding 100%). There are 2204 employees in total, 55% males and 45% females, 47 is the average age and a monthly average salary of \$14,574 pesos. By using the formulae and the assumptions mentioned in previous sections, it was found that the actuarial liabilities for this plan represent at the moment more than \$4,500 million of pesos and are going to increase to a maximum of \$8,300 million of pesos in 2027. Considering that the university expects to have a total budget of \$1,500 million of pesos each year, the university will fail to cover the costs by 2027.

A similar situation is found at 65% of the public universities in Mexico, where in some cases the actuarial liabilities represent the 536% of their total income (Muñoz, 2015). That is, the costs associated with pensions in public universities in Mexico vary from 0.5% and 536% of the total income. Shared risk schemes will offer employers, who cannot afford or are unwilling to take on the long-term risks associated with a balance of cost defined benefit scheme, a new kind of shared-risk scheme or a total transfer of the risk to the participant of the pension plan. This is confirm with CONSAR that in 2016 mentioned that 18% of the private pension plans were closed to new members (Hernández, 2016).

On the other hand, in 2027 the cash flows for the retirees reach its maximum with 300 million of pesos. In 2035, the active members' annual payments reach its maximum with 600 million of pesos. It was also found that cash flows will be extinguished in 2089, as no other retirement will occur. A similar situation is found at most of the public universities in Mexico that designed pension plans in the past. Some of them, have

already closed their plans to new members because of the high financial cost this represents. The total actuarial liabilities for public universities in Mexico represent 1,000,000 million pesos ("Pensiones Universitarias", 2014), which shows the importance of this plan costs.

The dependency ratio was also analyzed. The results showed that there is an extremely high dependency between pensioners and active members. Then, if we assume that the pension plan is of a defined benefit type and unfunded, in 2015 an active member will have to contribute 70% of his or her salary in order to finance the pension of one retiree, which is rather impossible. In 2036 gets worse as this increases to 8600%. If we compare this situation with public universities pensions in the United States, it is found that the U.S. active member to beneficiary ratio was 1.5 to 1 in 2015 (U.S. Census Bureau, 2016). Situation that is nothing compared with the situation of the majority of the public universities in Mexico. Also, we found that Government contributions for state- and locally-administered pension systems increased 8.3%, earnings on investments decreased 68.4% and that total payments increased 5.1% from 2014 to 2015.

Then, the shift from Defined Benefit (DB) schemes to Defined Contribution (DC) provision is now extremely common among the private sector companies, which do provide pension benefits. This means also further closures of DB funds to new members, and an increasing trend of closure of funds to new accruals for existing members. An example of this is the pension plan that was described in this article. The main reasons for this rapid change in provision are because employers have felt unable to finance the cost of current levels of defined benefits.

These current costs have increased mainly due to the increase on the number of pensioners with respect to the number of workers, and the increase on the life expectancy among the population. Shared risk schemes offer employers the ability to control costs into the future by way of the ability to increase normal pension age or to hold back targeted indexation of benefits until the scheme could safely pay such benefits, as has happened in the last years with public pension systems worldwide.

Finally, it is worth to mention that the numerical results found in this work are extremely difficult to compare with other public universities, as the data to calculate the actuarial liabilities is not available. This is normal as the information needed to complete the calculations (mentioned in section 3) is confidential and therefore, the plan costs. At the moment,

there is a great uncertainty among the public universities for the risks that these pension plans represent. The authors of this work want to thank the authorities that provide with the information needed to be able to present these results.

## REFERENCES

- Aitken, W. H., (1996). A problem-solving approach to pension funding and valuation. Winsted: ACTEX Publications.
- Barth, M. E., Beaver, W. H., & Landsman, W. R. (1992). The market valuation implications of net periodic pension cost components. *Journal of Accounting and Economics*, 15(1), 27-62.
- Bikker, J. A., & De Dreu, J. (2009). Operating costs of pension funds: the impact of scale, governance, and plan design. *Journal of Pension Economics and Finance*, 8(01), 63-89.
- Blake, D. (2006). *Pension Finance*. London: John Wiley & Sons.
- Booth, P., Chadburn, R., Haberman, S., James, D., Khorasane, Z., Plumb, R. H., & Rickayzen B. (2002). *Modern Actuarial Theory and Practice*. Boca Raton. FL: Chapman and Hall/CRC.
- Clark, R. L. & Craig, L. A. (2011). Determinants of the generosity of pension plans for public school teachers, 1982–2006. *Journal of Pension Economics and Finance*, 10(01), 99 – 118.
- CONSAR (2015) Diagnóstico del sistema de pensiones. Secretaría de Hacienda y Crédito Público. Retrieved August 19, 2016: [http://www.consar.gob.mx/otra\\_informacion/pdf/transparencia/informes/Diagnostico\\_del\\_Sistema\\_de\\_Pensiones.pdf](http://www.consar.gob.mx/otra_informacion/pdf/transparencia/informes/Diagnostico_del_Sistema_de_Pensiones.pdf)
- Coronado, J. L., & Sharpe, S. A. (2003). Did pension plan accounting contribute to a stock market bubble?. *Brookings Papers on Economic Activity*, 2003(1), 323-371.
- Foster, L. (2007). Do Women Teachers Get a Fair Deal? An Assessment of Teachers' Pensions. *Social Policy and Society*, 7(1), 41-52.
- Godwin, J. H., Goldberg, S. R., & Duchac, J. E. (1996). An empirical analysis of factors associated with changes in pension-plan interest-rate assumptions. *Journal of accounting, auditing & finance*, 11(2), 305-322.
- Gruber, J., & Wise, D. (2000). Social security programs and retirement around the world. In *Research in Labor Economics* (pp. 1-40). Emerald Group Publishing Limited.

- Hernández, A. (2016). México con 2 mil planes privados de pensiones. Retrieved, January 7, 2017, from <http://www.eluniversal.com.mx/articulo/cartera/finanzas/2016/09/1/mexico-con-2-mil-planes-privados-de-pensiones>.
- Hicks, E. L. (1965). Accounting for the cost of pension plans. American Institute of Certified Public Accountants.
- Jin, L., Merton, R. C., & Bodie, Z. (2006). Do a firm's equity returns reflect the risk of its pension plan?. *Journal of Financial Economics*, 81(1), 1-26.
- Muñoz (2015) Estados Mexicanos Enfrentan Presión por Pensiones no Fondeadas de Universidades [Press release]. Moody's Investors Service.
- OECD (2015). Reviews of Pension Systems, Mexico. Retrieved August 19, 2016: [https://www.consar.gob.mx/otra\\_informacion/pdf/OECD-Mexico-Pension-System-Review-2015.pdf](https://www.consar.gob.mx/otra_informacion/pdf/OECD-Mexico-Pension-System-Review-2015.pdf)
- Pensiones Universitarias: el pasivo laboral de un billón de pesos. (2014). Arena Pública. Retrieved August 8, 2016, from <http://www.arenapublica.com/articulo/2014/08/27/2102>
- Turner Hurtado, A. (2011). Planes privados de pensiones en México. Situación actual y perspectivas. Retrieved January 7, 2017, from [http://icpr.itam.mx/Pension2011/Turner\\_2011.pdf](http://icpr.itam.mx/Pension2011/Turner_2011.pdf)
- U.S. Census Bureau. (2016). Annual Survey of Public Pensions: State- and Locally Administered Defined Benefit Data Summary Brief: 2015. Retrieved August 19, 2016, from <https://www.census.gov/content/dam/Census/library/publications/2016/econ/g15-aspp-sl.pdf>

---

# Chapter 5

---



## CRM as a Fostering Tool for Competitiveness: Plastic Manufacturing SMEs

*By José Sánchez-Gutiérrez, Tania-Elena González-Alvarado and  
Oscar Alejandro Espinoza-Mercado*



# CRM as a Fostering Tool for Competitiveness: Plastic Manufacturing SMEs in the ZMG

José Sánchez-Gutiérrez  
Tania-Elena González-Alvarado  
Oscar Alejandro Espinoza-Mercado  
Universidad de Guadalajara, México

## INTRODUCTION

Manufacturing SMEs, specifically those that are part of the industry, have to take into account several tools such as CRM (Customer Relationship Management), which is an element of business strategy that helps to raise awareness of the importance of the customer (Kaplan & Norton, 2001;



Chalmeta, 2006; Yeh-Yun Lin, & Yi-Ching, M., 2007; Richards & Jones, 2008; Verhoef et al., 2009; Van de Vrande et al., 2009), since they are actually the main reason to remain present. Therefore, it is necessary to make the operational changes that are needed for this purpose, mainly those that have to do with customer service, as well as those regarding to the products offered by the company, sales, order management, everything related to distribution and logistics, billing and collections; But above it all, it requires a change of mentality, company's philosophy and SMEs efforts that have to work a lot in this workforce (Hernandez, Gandara and Macias, 2012).

At the international level, the development of the plastic sector has a significance within innovation and competitiveness levels. So, it is important to carry out a diagnosis of the situation of plastic sector SMEs in Jalisco, in order to help to identify the way in which companies are organized and, as well as the strategies that are taking place to generate the conditions that produce innovation processes, that at the same time, impact in their competitiveness levels. According to the OECD (2010), small firms are playing an ever-increasing role in innovation, driven by changes in technologies and markets. Some spin-offs and high growth firms are having remarkable success. However, the broad bulk of small firms are not capitalising on their advantages. (OECD, 2010)

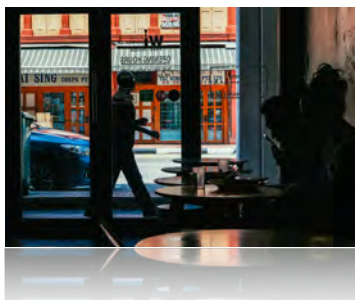


## 1. CONTEXTUAL FRAMEWORK.

### 1.1. Mexican SMEs in the world.

As time goes on, SMEs have realized that they are capable of delivering high quality degree products to their customers (Carpintero, 1998; Anzola, 2002; Perez & Stumpo, 2002), much of this is due to innovation, being in a more demanding market (Salavou, 2002; Keskin, 2006; Low, Chapman, & Sloan, 2007; Lee, et al., 2010). This is actually due to the fact that they have adapted to their customer needs and changes that exist in their environment.

Lloyd, Muller and Wall (2002) argue that SMEs size presents the opportunity to innovate and thus cope with a competitive advantage, since their organizational structures are simpler and adapt more easily to changes. These small enterprises are quite important since they are fundamental to every development country. The small and medium sized enterprise sector accounts for 99% of firms in the OECD area, and 50-70% of value added across these countries. (OECD, 2010)



Small and medium-sized enterprises (SMEs) in Latin America, Asia, the United States and Europe make up the vast majority of the business world (OECD, 2000; Gonzalez, 2002; OECD, 2002; Gonzalez, 2005). That is why it is important for them to acquire regional or local economic development.

SMEs have a key role to play in enhancing Latin America's growth potential. But SMEs are highly heterogeneous in terms of access to markets, technologies and human capital, as well as their linkages with other firms, and these factors affect their productivity, export capacity and potential growth. (OECD & ECLAC, 2012).

Throughout the world there are companies of different dimensions, the variables or criteria that are taken into account for their classification differ in each country (Gonzalez, 2002). Latin American SMEs are highly heterogeneous (Gonzalez, 2002; OECD & ECLAC, 2012). As for Mexico, the business order is instituted by the Ministry of Economy. For this purpose, it establishes the criteria for stratification of the number of

employees and economic activity, resulting in the classification presented in Table 1. Mexican classification includes self-employment, for this reason exist micro enterprises with zero employee.

Tabla 1. Mexican enterprises stratification

Sector	Micro		Small		Medium	
	Employees	Annual Sales Amount Range (mdp)	Employees	Annual Sales Amount Range (mdp)	Employees	Annual Sales Amount Range (mdp)
Industry	0-10	Until \$4	11-50	from \$4.01 until \$100	51-250	from 100.1 until \$250
Commerce	0-10	Until \$4	11-30	from \$4.01 until \$100	31-100	from 100.1 until \$250
Service	0-10	Until \$4	11-50	from \$4.01 until \$100	51-100	from 100.1 until \$250

Source: DOF, 2009.

Data collected by the National Institute of Statistics and Geography (INEGI) during the 2014 economic census shows that in Mexico by 2014 there are more than 4 million companies, 97.6% are micro-enterprise and they concentrate 75.4% of the overall employed people, followed by small companies with 2.0% and 13.5%, finally medium-sized companies representing 0.4% and 11.1%.

Small and medium-sized enterprises, SMEs, are of particular importance to national economies, not only for their contributions to the production and distribution of goods and services, but also for the adaptation flexibility to technological changes and great potential for job creation. They represent an excellent means to boost economic development and a better distribution of wealth.

Today, governments in developing countries recognize the importance of SMEs for their contribution to economic growth, job creation, and regional and local development. To give an idea of what this number of companies means, we can compare our figures with those of other nations, taking into consideration the relative sizes of their respective economies in relation to that of Mexico.

Based on the above information (table 2) almost under any parameter, in our country there is a wide number of companies for the economic apparatus size. The number of industries is similar to that of the United States and Japan if we take the total registered.

Tabla 2. Manufacturing enterprises

Country	Manufacturing enterprises	GDP regarding Mexico's (Mexico = 1)
United States	355,597	17.5
Japan	331,859	7.9
United Kingdom	240,928	2.4
France	210,778	2.4
Germany	70,777	3.2
Canada	30,254	1.2
Italy	30,122	2.0
Mexico 1)	344,118	1.0
Mexico 2)	144,655	1.0

Source: Encyclopaedia Britannica, Book of the Year 2003.

Table 3. Plastic Manufacturing SMEs at the Metropolitan Area of Guadalajara

	2009	2014	Growth rate
Micro	374	462	24%
Small	206	245	19%
Medium	68	84	24%

Source: IIEG (2017).

### 1.2. The small and medium enterprises of the plastic industry of the Metropolitan Area of Guadalajara.

Jalisco state it is considered as the federative entity of the country that goes to the tip in comparison to other states in the plastic manufacture. The manufacturing industry is considered by the National Institute of Statistics as one of the most important economic activities in the state. The number of plastic manufacturing SMEs has increased in recent years (Table 3).

Mexico imports 55.2% of the total consumption of plastics and exports 33.6% of local production (Conde, 2012). The improvements in design and productivity levels in the processes is the only way to compete with the import products that we have in Mexico. There are opportunities for import substitution according to the national demand (Table 4).

Therefore, we must take advantage of the high consumption of modern plastic that is currently creating designs according to demand, all these characteristic points of industry and knowledge of the international context lead us to thoroughly analyze the mechanisms that allow us to carry out this setting. More ahead there is a table in which strengths and

weaknesses regarding the plastic industry in Metropolitan Area of Guadalajara are analyzed.

Table 4. Mexican Market segmentation (2011)

Market segment	Consumption (Ton/Year)
Container	2,620,000
Consumption	868,000
Construction industry	845,000
Automotive	380,000
Electric-electronic	318,000
Agricultural	220,000
Others	41,000
Total	5,300,000

Source: Conde (2012).

There are a few research projects about the CRM and the SMEs in Guadalajara with interesting results. One of them is about de electronic sector, and the other is about the Jewelry industry (Sanchez, Ramirez & Garcia, 2008; Sanchez, Sigala & Sandoval, 2009). Both of them analyzing the relationship between CRM and Competitiveness. The presents results and discussing in this paper are the continuity of the same study.

## 2. THEORETICAL CONCEPTS

### 2.1. Customer Relationship Management

Customer relationship management (CRM) refers to building one-to-one relationships with customers that can drive value for the firm (Kumnar, 2010; Knox et al, 2007; Payne & Frow, 2005; Barnes, 2001). CRM is a combination of people, processes and technology that seeks to understand a company's customers. It is an integrated approach to managing relationships by focusing on customer retention and relationship development. (Chen & Popovich, 2003)

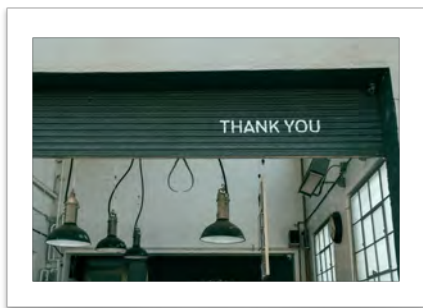
According to Trainor, Adzulis, Rapp and Agnihotri (2014), CRM is much more than the simple management of customer databases, suggesting to analyze the use of technology with the interaction of organizational resources. On the other hand, Porras (2001) says that successful

marketing aims to know and understand the consumer so much that the product or service meets their needs and gets sold without promotion.

CRM states that companies must develop lasting relationships with the client and keep them over time, as the only alternative to develop their trust and loyalty to know their preferences and particularities. In contrast, it has allowed organizations to better listen to their customers to adapt services and products to their true interests and needs. The organizations had an empirical way of treating clients, they did not use database to know their customers, since they lived nearby and everyone knew each other, nowadays it is called CRM.

Hoffman & Bateson (2000) mention that Customer Relationship Management is a process for attracting, differentiating and retaining customers. Moreno (2015) expresses that customer relationship management (CRM) is a strategic procedure that companies do to ensure that their clients are faithful to the company.

For Payne and Frow (2005) CRM combines relational marketing strategies with information technologies to establish relationships with customers, as well as opportunities to use the information obtained to understand customers. This tool is of great help to improve the



profitability, productivity, marketing, the ease of knowing how to satisfy the clients to whom a company is directed, reducing costs, knowing the characteristics of the target clients (Brown 2000). As a matter of fact, CRM helps to segment customers according to the customer's income, tastes and behavior; the key element to this tool is linked to the capacity of the company to respond to

customers' needs and tastes (Cabanelas, Cabanelas and Lorenzo, 2007).

CRM seeks to maintain positive customer relationships, increase loyalty and satisfaction, and most importantly, strive to maximize its Customer Life Cycle Value (LCV) over the relationship duration (Persson and Ryals, 2014). Chen and Popovich (2003) perceive the CRM as an integral combination of people, processes and technology development that try to understand the requirements of the clients, this obviously leads to locate updated the customer satisfaction and its perception of our

relationship with them, it would lead to greater loyalty to them. On the other hand, Mishra and Mishra (2009) comment that relationship marketing helps organizations to effectively manage interactions with consumers, in a way that helps to improve competitiveness.

## 2.2. Competitiveness.

Competitiveness is a concept applicable to different levels of analysis whether it is a country, sector of activity or a company. First, Competitiveness is a central preoccupation of both advanced and developing countries in an increasingly open and integrated world economy (Porter, Ketels & Delgado, 2007). Second, the prevalence of clusters reveals important insights about the microeconomics of competition and the role of location in competitive advantage (Porter, 2000). Clusters represent a way of thinking about national, state, and local economies, and they necessitate new roles for companies, government, and other institutions in enhancing competitiveness (Porter, 2000). Third and last, enterprises means both supporting and supplying activities and the entrepreneurial climate in the industry itself (Padmore & Gibson, 1998).

Porter (1991) conceives competitiveness as competitive advantages have definitively displaced the classical conception of comparative advantages. Capacities in the endowment of natural resources of a country determined the competitive level of it (Rodrik, 2007; Isham et al., 2005; Crouch & Ritchie, 1999; Grant, 1991; Pearce & Turner, 1990; Krugman, 1987; Dunnig, 1980). This is an aspect that becomes increasingly important in the field of business, which is derived from the demands of the current economic environment framed in the global crisis (Li et al., 2016; Shen, Au & Birtch, 2016; Trapczynski et al., 2016; Madrid, García & Van Auken, 2016; Detarsio, North & Ormaetxea, 2016). For Solleiro and Castañón (2005) competitiveness is a complex concept and can be studied from different approaches and disciplines; so it is not possible to establish a single definition; due to its usefulness that lies in identifying ways to promote companies that contribute to raising real levels of well-being. However, there are some concepts related to competitiveness: competitiveness is defined as the process of dynamic integration of countries and products into international markets, depending on both supply and demand conditions (Dussel, 2001). Competitiveness is related to the capacity to increase the standard of living, to generate sustained productivity, to be successfully inserted in

international markets (Reinert, 1995; Cellini & Soci, 2002; Garelli, 2003; Kitson, Martin & Tyler, 2004; Padilla, 2006).

Competitiveness reflects the extent to which a nation, in a system of free trade and fair market conditions, can produce goods and services that surpass the test of international markets, while maintaining and increasing the real income of its population at a long term (OECD, 1996). The concept of competitiveness involves static and dynamic components: although a country's productivity is clearly determined by the ability to sustain its income levels, it is also one of the central investment return determinants, which is one of the Key factors to explain a growing economy (World Economic Forum, 2009).

### 2.3. Competitiveness in the business sector.

Krugman (1994) has pointed out that companies are competing, not nations; a country is competitive due to companies; this is the basis of competitiveness. For this reason, companies' competitiveness depends on factors at three levels: the first level is the competitiveness of the country, which includes variables such as macroeconomic stability, openness and access to international markets or complexity of regulation for the business sector; the second level refers to regional infrastructure; a third level that explains a companies' competitiveness has to do with what happens within the company itself (Cervantes, 2005). Also, business competitiveness is derived from the competitive advantage that a company has through its production and organizational methods (reflected in price and final product quality) in relation to those of its rivals in a specific market (Abdel & Romo, 2004).

For Solleiro and Castañón (2005) competitiveness is the ability of an organization to maintain or increase its participation in the market based on new business strategies, sustained productivity growth, inter-enterprise capacity to participate in negotiations with different institutions and other companies within their environment, in a competitive environment determined by the sector and the consumer market and in policies introduced by national governments and regional economic alliances.

#### 2.3.1. Elements that influence competitiveness in SMEs:

Based on OECD data (1992, cited in Solleiro & Castañón), the elements that influence competitiveness in companies are:

- Successful management of production flows, raw materials and inventories.

- Successful management of the interaction mechanisms between planning, marketing, research and formal development, design, engineering and industrial production.
- The ability to combine research and development and innovation activities in cooperation with universities and other enterprises.
- The ability to incorporate more precise definitions of demand characteristics and market evolution in the design and production of strategies.
- The ability to successfully organize inter-company relationships with suppliers and customers.
- Improvement of workers' capacities through investment in specialized training and the generation of high levels of responsibility for production workers.

The above elements only include aspects that can be controlled by the companies, considering the relationship with the universities and the customer-supplier relationship. Finally, being competitive today is vital for the survival of SMEs by being a reference of anticipation capacity and responses to the challenges of the environment (Bhamra, Dani & Burnard, 2011; Welter & Smallbone, 2011; Camisón, 1997). To improve competitiveness, SMEs have the need to adapt both their strategies and their organizational structure and management to the dynamic environment of today's economy. However, many companies persist in a conservative attitude waiting to observe the operability of certain strategies to introduce changes in their structures. But these companies can learn about its customers, finally it could be the principal factor of organizational change with low cost and big opportunities.

### 3. METHODOLOGY

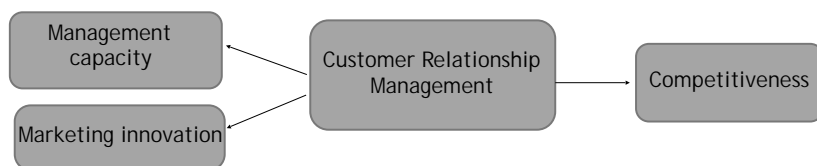
The methodology is a process or technique that enables to arrive at a determined result. Bernal (2006) mentions that there are different types of methods for conducting research, such as: inductive, deductive, inductive-deductive, hypothetical-deductive, analytical, synthetic, analytical-synthetic, historical-comparative, quantitative, qualitative, comparative and dialectical. The method used for this research is the quantitative method that is defined as the measurement of characteristics of social phenomena through observation and experimentation which quantifies reality and uses statistical tests for data analysis (Lara, 2011).



For a population analysis it is preferably done by means of a sample that is the representative set of elements, since it helps to obtain information similar to the one of a census of quickly and low cost. There are several types of sampling: stratified sampling, clusters, simple and systematic random. In this case the type of simple random sampling was used, that is to say that each company of the population has the same probability of being selected. A personal survey was conducted to 129 companies. The survey was conducted with a confidence level of 97% and with a 4% error. The results were captured in the SPSS program for statistical analysis, since it facilitates the interpretation of the results and helps to have more information about it. This survey was carried out with the Likert scale, where all the items measured with the same intensity. In this process the respondent provides with an answer which goes from 1 to 5, wherein 1 means “totally disagree” and five “totally agree”. Results were obtained through the following formula:

$$n = z^2 \frac{N(p \cdot q)}{i^2 (N - 1) + z^2}$$

Figure 1. Model



Source: Created by the authors based on the results obtained in the project “Determinants of Competitiveness in SMEs” CA-UDG-484.

#### General objective.

To analyze the relationship between CRM and competitiveness within plastic manufacturing SMEs in the ZMG.

#### Specific objectives.

1. To analyze the relationship between Management capacity and CRM within plastic manufacturing SMEs in the ZMG.
2. To analyze the relationship between Marketing innovation and CRM within plastic manufacturing SMEs in the ZMG.

#### Hypothesis

H1: The greater implementation of a CRM system, the greater competitiveness.

H2: The Management capacity is related to CRM, the managers have helped to make changes in the CRM and achieve the planned results.

H3: The Marketing innovation is related to CRM, the managers focuses on terms of regaining the relationship with the lost customer.

#### 4. STUDY RESULTS AND CONCLUSION

We show the results of the applied survey, where Cronbach alpha box helps us to evaluate the reliability of the items of an instrument. Generally, a group of items exploring a common factor shows a high Cronbach alpha value (Streiner, 2003). On the other hand we present the KMO test table and the sphericity of Barlett test. The investigation was carried out for companies dedicated to the plastic industry in the State of Jalisco in the Metropolitan Area of Guadalajara, which is constituted by the municipalities of Zapopan, Tlaquepaque, Tonalá, El Salto and Tlajomulco. The questionnaire was based on the Likert scale where respondents answered one if they totally disagreed or five if they totally agreed. The results obtained are shown below, starting with Cronbach alpha analysis.

Table 4. Cronbach alpha coefficient CRM and competitiveness

Cronbach alpha coefficient	Elements number
.905	26

Source: Created by the authors based on the results obtained in the project “Determinants of Competitiveness in SMEs” CA-UDG-484.

It can be observed that the variables of the questionnaire can be explained with statistics, that is to say, that there is a high reliability in the questionnaire applied with an index of 0.905.

Table 5. Bartlett and KMO test. CRM and Competitiveness

Kaiser-Meyer-Olkin measure of sampling adequacyMedida Kaiser-Meyer- mn		.848
Adecuacity sampling Oklin		
Bartlett esphericity test	Aprox. Chi-cuadrado	1654.793
	gl	325
	Sig.	.000

Source: Created by the authors based on the results obtained in the project “Determinants of Competitiveness in SMEs” CA-UDG-484.

Table 5 shows that the Kaiser-Meyer-Olkin measure of sampling adequacy is considerably high: 0.848, and a 1654.793 Chi-square. This means that the number of items that are useful in the questionnaire is

high. It is observed that there are 325 degrees of freedom which means that manufacturing companies answered several different answers.

Based on table 6, it is corroborated that the Management capacity is related to CRM, the managers have helped to make changes in the CRM and achieve the planned results, so the first hypothesis is proven. As for the current analysis, it is worth to mention that CRM 3 (7.082 quadratic mean) and CRM 1 (6.782 quadratic mean) turned out to be the most important ones since they got a reasonable result, which means that they are highly representative. In CRM 3, it can be assumed that it is quite important to consider the customer relationship since most of the objectives have to do with the customer. It all comes down to the change awareness and objectives orientation.

Table 6. Management Capacity - CRM (ANOVA)

		Sum of squares	gl	Quadratic mean	F	Sig.
CRM1	Between groups	101.733	15	6.782	19.142	.000
	Within groups	40.391	114	.354		
	Total	142.123	129			
CRM2	Between groups	85.358	15	5.691	26.624	.000
	Within groups	24.366	114	.214		
	Total	109.723	129			
CRM3	Between groups	106.226	15	7.082	21.890	.000
	Within groups	36.882	114	.324		
	Total	143.108	129			
CRM4	Between groups	97.595	15	6.506	11.168	.000
	Within groups	66.413	114	.583		
	Total	164.008	129			

Source: Created by the authors based on the results obtained in the project "Determinants of Competitiveness in SMEs" CA-UDG-484.

By giving a deeper glance to table 7 it is simple to detect CRM 1 as the one which follows the most representative. By saying so, a quadratic mean of 6.782 is worth to stand out, since it actually expresses the second most representative one. It is actually linked to identifying related factors that have to do with such a relationship management.

As for measures of marketing innovation with respect to business and innovation, the company focuses on terms of regaining the relationship with the lost customer. Given the circumstances the plastic industries turned out to be more focused on the relationship with the customer and manage to implement a good marketing system to recover customers.

Table 7. Measures of marketing innovation with respect to the company and innovation

		Sum of squares	gl	Quadratic mean	F	Sig.
CRM	Between groups	101.733	15	6.782	19.142	.000
1	Within groups	40.391	114	.354		
	Total	142.123	129			
CRM	Between groups	85.358	15	5.691	26.624	.000
2	Within groups	24.366	114	.214		
	Total	109.723	129			
CRM	Between groups	106.226	15	7.082	21.890	.000
3	Within groups	36.882	114	.324		
	Total	143.108	129			
CRM	Between groups	97.595	15	6.506	11.168	.000
4	Within groups	66.413	114	.583		
	Total	164.008	129			

Source: Created by the authors based on the results obtained in the project  
 “Determinants of Competitiveness in SMEs” CA-UDG-484.

The current research was carried out for small and medium-sized enterprises (SMEs), which have between 11 and 250 employees in the organization, without considering micro-enterprises that have less than 10 workers.

The study aimed to focus manufacturing industries in the Metropolitan Area of Guadalajara, addressing the municipalities of Guadalajara, Zapopan, Tlaquepaque, Tonalá, Tlajomulco and El Salto.

Surveys were applied only to senior managers, managers or first level managers, which still makes us think whether the given results would have the same appreciation from lower levels.

## REFERENCES

- Abdel, G. & Romo, M. (2004). Sobre el concepto de competitividad. Comercio Exterior, 55(3), 200-214.
- Anzola, S. (2002). Administración de Pequeñas Empresas. Mexico: McGraw Hill.
- Barnes, J. G. (2001). Secrets of customer relationship management: It's all about how you make them feel. McGraw-Hill Companies.

- Bhamra, R., Dani, S., & Burnard, K. (2011). Resilience: the concept, a literature review and future directions. *International Journal of Production Research*, 49(18), 5375-5393.
- Cabanelas J., Cabanelas P. y Lorenzo J. (2007). La gestión de las relaciones con los clientes como característica de la alta rentabilidad empresarial. *Revista Europea de Dirección y Economía de la Empresa*, 16(3), 133-148.
- Carpintero, S. (1998). Los Programas de Apoyo a la Microempresa en América Latina, El microcrédito como la gran esperanza del siglo XXI, Bilbao: Deusto, 182 pp.
- Cellini, R., & Soci, A. (2002). Pop competitiveness. *Banca Nazionale del Lavoro Quarterly Review*, 55(220), 71.
- Chalmeta, R. (2006). Methodology for customer relationship management. *Journal of systems and software*, 79(7), 1015-1024.
- Chen, I. J. & Popovich, K. (2003). Understanding customer relationship management (CRM) People, process and technology. *Business Process Management Journal*, 9(5), 672-688.
- Conde, M. P. (2011). Presente y Futuro de la Industria del Plástico en México. *Ambiente plástico*. México: Centro Empresarial del Plástico.
- Crouch, G. I., & Ritchie, J. B. (1999). Tourism, competitiveness, and societal prosperity. *Journal of business research*, 44(3), 137-152.
- Detarsio, R., North, K., & Ormaetxea, M. (2016). Surviving and Competing in Times of Crisis: Cases of Strategies by Argentine SMEs. In *Competitive Strategies for Small and Medium Enterprises* (pp. 139-151). Springer International Publishing.
- Dunning, J. (1980). Toward an eclectic theory of international production: Some empirical tests. *Journal of international business studies*, 11(1), 9-31.
- Dussel, E. (2001). Un análisis de la competitividad de las exportaciones de prendas de vestir de Centroamérica utilizando los programas y la metodología CAN y MAGIC. Mexico: UN-ECLAC.
- Dwyer, L., & Kim, C. (2003). Destination competitiveness: determinants and indicators. *Current issues in tourism*, 6(5), 369-414.
- Garelli, S. (2003). Competitiveness of nations: the fundamentals. *IMD World competitiveness yearbook*, 702-713.
- González, T. (2002). Limitaciones de la información para estudios comparativos de micro, pequeña y mediana empresas de diferentes

- regiones o países. VII Congreso Internacional en Contaduría Administración e Informática, ANFECA, FCA, UNAM.
- González, T. (2005). Problemas en la definición de microempresa. *Revista Venezolana de Gerencia*, 10(31), 408 - 423.
- Grant, R. M. (1991). Porter's 'competitive advantage of nations': an assessment. *Strategic management journal*, 12(7), 535-548.
- Hernández, M., Gándara, M. y Macías, M. (2012). Factores estratégicos del CRM en las pymes de la ZMG que mejoren su posición competitiva en la industria mueblera. Vol. 6, Mexico: Red Internacional de Investigadores en Competitividad.
- Hoffman, N. (2000). An examination of the Sustainable Competitive Advantage Concept: Past, Present and Future. *Academy of Marketing Science Review*, 4, 1-20.
- IIEG (2017). Industria del Hule y Plástico. Ficha Técnica. Mexico: Instituto de Información Estadística y Geográfica.
- INEGI (2014). Micro, pequeña, mediana y gran empresa. Estratificación de los Establecimientos. Censos económicos, Mexico: INEGI.
- Isham, J., Woolcock, M., Pritchett, L., & Busby, G. (2005). The varieties of resource experience: natural resource export structures and the political economy of economic growth. *The World Bank Economic Review*, 19(2), 141-174.
- Kaplan, R. S., & Norton, D. P. (2001). The strategy-focused organization. *Strategy and Leadership*, 29(3), 41-42.
- Keskin, H. (2006). Market orientation, learning orientation, and innovation capabilities in SMEs: An extended model. *European Journal of innovation management*, 9(4), 396-417.
- Kitson, M., Martin, R., & Tyler, P. (2004). Regional competitiveness: an elusive yet key concept?. *Regional studies*, 38(9), 991-999.
- Knox, S., Payne, A., Ryals, L., Maklan, S., & Peppard, J. (2007). *Customer relationship management*. Routledge.
- Krugman, P. (1994). Competitiveness: a dangerous obsession. *Foreign affairs*, 28-44.
- Krugman, P. (1987). The narrow moving band, the Dutch disease, and the competitive consequences of Mrs. Thatcher: Notes on trade in the presence of dynamic scale economies. *Journal of development Economics*, 27(1-2), 41-55.
- Kumar, V. (2010). *Customer relationship management*. John Wiley & Sons.

- Lara, E. (2011). *Fundamentos de Investigación*. México: Alfaomega.
- Lee, S., Park, G., Yoon, B., & Park, J. (2010). Open innovation in SMEs—An intermediated network model. *Research policy*, 39(2), 290-300.
- Li, W. Y., Chow, P. S., Choi, T. M., & Chan, H. L. (2016). Supplier integration, green sustainability programs, and financial performance of fashion enterprises under global financial crisis. *Journal of Cleaner Production*, 135, 57-70.
- Lloyd, L., Muller, K. & Wall, S. (2002). Innovation and educational policy in SMEs: a Czech perspective. *Education y Training*, 378-387.
- Low, D. R., Chapman, R. L., & Sloan, T. R. (2007). Inter-relationships between innovation and market orientation in SMEs. *Management Research News*, 30(12), 878-891.
- Madrid, A., García, D., & Van Auken, H. (2016). Financing constraints and SME innovation during economic crises. *Academia Revista Latinoamericana de Administración*, 29(1), 84-106.
- Mishra, A. & Mishra, D. (2009). Customer Relationship Management: implementation process perspective. *Acta Polytechnica Hungarica*, 6(4), 83-99.
- Moreno, F. (2015). *Perspectiva General del Customer Relationship Management*. *Gaceta Sansana*, 2(6), 20-41
- OECD. (1996). *Industrial Competitiveness: Benchmarking Business Environments In The Global Economy*. Paris: OECD.
- OECD (2000). *OECD Small and médium Enterprise outlook*, París: OECD, 222 pp.
- OECD (2002). *OECD Small and médium Enterprise outlook*, París: OECD, 248 pp.
- OECD (2010), chapter "Introduction", in *SMEs, Entrepreneurship and Innovation*, OECD Publishing, Paris.
- OECD & ECLAC (2012). *Latin American Economic Outlook 2013: SMEs policies for structural change*. Paris: OECD/UN-ECLAC. 185 pp.
- Padilla, R. (2006). *Instrumento de medición de la competitividad*. Mexico: CEPAL.
- Padmore, T., & Gibson, H. (1998). Modelling systems of innovation:: II. A framework for industrial cluster analysis in regions. *Research policy*, 26(6), 625-641.
- Payne, A. & Frow, P. (2005). A Strategic Framework for Customer Relationship Management, *Journal of Marketing*, 69(4), 167-176.

- Pearce, D. W., & Turner, R. K. (1990). *Economics of natural resources and the environment*. JHU Press.
- Peres, W., & Stumpo, G. (coord.) (2002). *Pequeñas y medianas empresas industriales en América Latina y el Caribe, México, CEPAL/ Siglo XXI*, 550 pp.
- Persson, A. & Ryals, L. (2014). Making customer relationship decisions: Analytics rules of thumb. *Journal of Business Research*, 67(8), 1725-1732.
- Porras, C. (2001). Cuatro pilares para intimar con el cliente. *Biblios Revista Electrónica de Bibliotecología, Archivología y Museología*, (10), 12- 15.
- Porter, M. E., Ketels, C., & Delgado, M. (2007). The microeconomic foundations of prosperity: findings from the business competitiveness index. *The Global Competitiveness Report 2007–2008*, 51-81.
- Porter, M. E. (2000). Location, competition, and economic development: Local clusters in a global economy. *Economic development quarterly*, 14(1), 15-34.
- Reinert, E. S. (1995). Competitiveness and its predecessors—a 500-year cross-national perspective. *Structural change and economic dynamics*, 6(1), 23-42.
- Richards, K. A., & Jones, E. (2008). Customer relationship management: Finding value drivers. *Industrial marketing management*, 37(2), 120-130.
- Rodrik, D. (2007). Industrial development: Some stylized facts and policy directions. *Industrial development for the 21st century: Sustainable development perspectives*, 7-28.
- Salavou, H. (2002). Profitability in market-oriented SMEs: does product innovation matter?. *European journal of innovation management*, 5(3), 164-171.
- Sanchez, J., Ramirez, A., & Garcia, K. (2008). Customer relationship management (CRM) and products development process as marketing knowledge in the Jewelry Industry: Cases in Guadalajara, México. *Competition Forum* 6 (2) p. 252.
- Sanchez, J; Sigala, M., & Sandoval, O. (2009). Customer Relationship Management linking with Marketing Knowledge in the electronic sector in Guadalajara. *Mercados y Negocios*, 1(20), 107-122.



- Shen, N., Au, K., & Birtch, T. (2016). The Performance of Chinese Private Firms in Coping with a Global Financial Crisis: Who Is Best Positioned?. *Frontiers of Business Research in China*, 10(4), 548.
- Solleiro, J. & Castañón, R. (2005). Competitiveness and innovation systems: the challenges for Mexico's insertion in the global context. *Technovation*, 4, 1059-1070.
- Streiner, D. (2003). Being inconsistent about consistency: when coefficient alpha does and doesn't matter. *Journal of personality assessment*, 80(3), 217-222.
- Trainor, K. J., Andzulis, J. M., Rapp, A. & Agnihotri, R. (2014). Social media technology usage and customer relationship performance: A capabilities-based examination of social CRM. *Journal of Business Research*, 67(6), 1201-1208.
- Trapczynski, P., Jankowska, B., Dzikowska, M., & Gorynia, M. (2016). Identification of Linkages between the Competitive Potential and Competitive Position of SMEs Related to their Internationalization Patterns Shortly after the Economic Crisis. *Entrepreneurial Business and Economics Review*, 4(4), 29
- Van de Vrande, V., De Jong, J. P., Vanhaverbeke, W., & De Rochemont, M. (2009). Open innovation in SMEs: Trends, motives and management challenges. *Technovation*, 29(6), 423-437.
- Verhoef, P. C., Lemon, K. N., Parasuraman, A., Roggeveen, A., Tsiros, M., & Schlesinger, A. (2009). Customer experience creation: Determinants, dynamics and management strategies. *Journal of retailing*, 85(1), 31-41.
- Welter, F., & Smallbone, D. (2011). Institutional perspectives on entrepreneurial behavior in challenging environments. *Journal of Small Business Management*, 49(1), 107-125.
- World Economic Forum (2009). *The Global Competitiveness Report 2009-2010*. Geneva.
- Yeh-Yun Lin, C., & Yi-Ching Chen, M. (2007). Does innovation lead to performance? An empirical study of SMEs in Taiwan. *Management Research News*, 30(2), 115-132.

---

# Chapter 6

---



## Digitalization bringing Innovation to the Chemical Industry

*By Supriyo Das, Ignasi Brunet-Icart, Carlos Alberto Santamaria-Velasco*



# Digitalization bringing Innovation to the Chemical Industry

Supriyo Das  
Ignasi Brunet-Icart  
Universitat Rovira I Virgili, España  
Carlos Alberto Santamaria-Velasco  
Universidad de Guadalajara, México

## INTRODUCTION

Economic and business trends are making it crucial for manufacturers to find new method for managing their operations and their business. As an example, chemical manufacturers and oil refiners face complex global supply chains, increased and dynamic regulatory requirements, rising costs of feedstock and energy, and mergers and acquisitions that result in disconnected computer systems. Data-driven innovation forms a key pillar in 21<sup>st</sup> century sources of growth. Companies are embracing digitalization strategy to transform their businesses, and driving innovation while balancing electronic capabilities with traditional business practices. One way to achieve new efficiencies that can help address these business challenges is to leverage new developments and trends in technology to establish a unified set of information technology (IT) architecture principles. This paper covers few important topics: innovation and its various components, how is digitalization part of chemical industry, how does digitalization represent an important opportunity for new product development, what elements are included in the digital marketing program, and how should the digital marketing organized in large chemical companies.

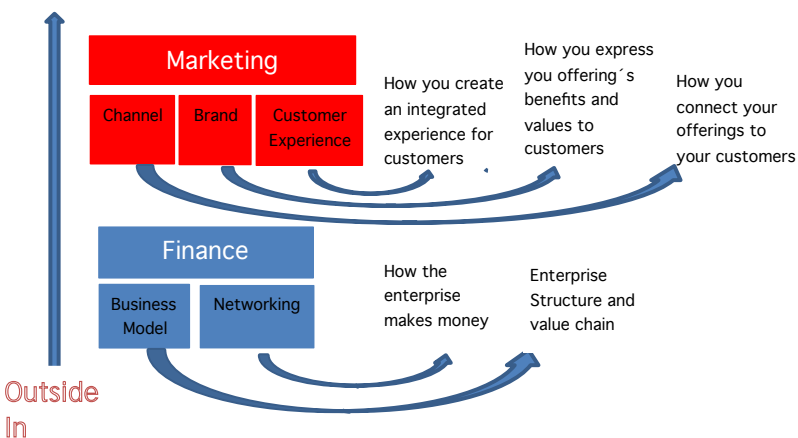
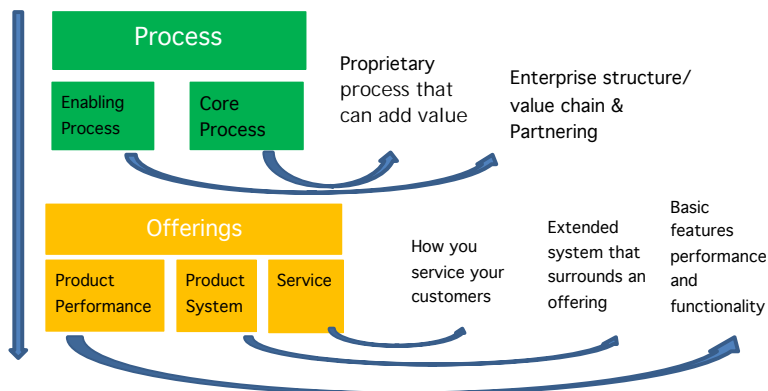
## 1. NEW PRODUCT DEVELOPMENT AND INNOVATION

Product development is a risky business: a significant number of new products that enter the market fail. New product development is described in the literature as the transformation of a market opportunity into a product available for sale (Brown and Eisenhardt, 1995) and it can be tangible (that is, something physical you can touch) or intangible (like a service, experience, or belief). Innovation is the process of translating

an idea or invention into a goods or service that creates value or for which customers will pay. In business and engineering, new product development (NPD) is the complete process of bringing a new product to market.

Figure 1: Ten different types of innovation in any business.

### Inside Out



Source: Author.

### 1.1. Innovation in an industrial environment.

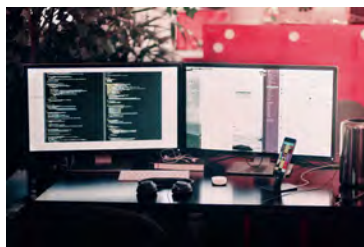
According to Han, Kim and Srivastava (1995), innovation is generally a new idea, device or process which can be viewed as the application of better solutions that meet new requirements, in articulated needs, or existing market needs. This is accomplished through more effective products, processes, services, technologies, or ideas that are readily available to markets, governments and society. Innovation is at the heart of economic change. Schumpeter (1934) comments that “radical” innovations shape big changes in the world, whereas “incremental” innovations fill in the process of change continuously.

Various types of innovations as proposed by Schumpeter (1934) are: introduction of a new product or a qualitative change in an existing product; process innovation new to an industry; the opening of a new market or changes in industrial organization; development of new sources of supply for raw materials or other inputs. According to UNESCO (2012), the innovation in a company can be broadly divided into four types: Product innovation, Process Innovation, Marketing innovation, Innovation in Finance. This can be sub-divided into ten groups of innovation as shown in the figure 1.

### 1.2. Digitalization of business

Digitalization is an emerging business model that includes the extension and support of electronic channels, content and transactions. Companies are embracing this strategy to transform their businesses, while balancing electronic capabilities with traditional business practices (hard-copy documents and correspondence, face-to-face interactions, and call center volume). The effects of an increasingly digitized world are now reaching into every corner of our lives because three forces are powerfully reinforcing one another:

**Customer needs and pull:** A good understanding of customer needs and wants, the competitive environment and the nature of the market represent the top required factors for the success of a new product. Cost, time and quality are the main variables that drive the customer needs. Aimed at these three variables, companies develop continuous



practices and strategies to better satisfy the customer requirements and increase their market share by a regular development of new products.

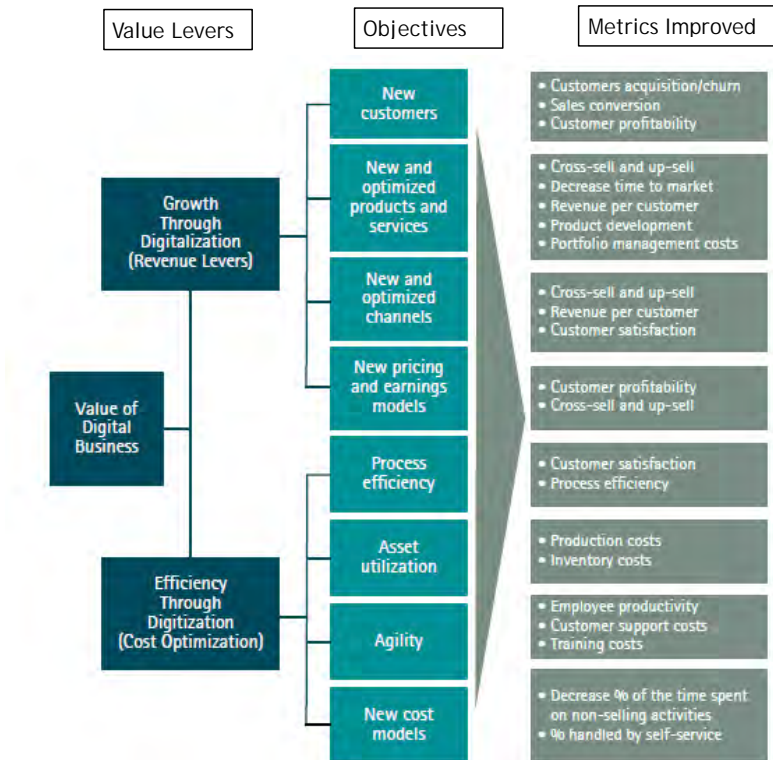
Technology revolution and push: Digital technology continues to expand its influence. The history of innovation is scattered with products and processes which only came into being as a result of an accident or proper planning. The confluence of several trends, including the increasing migration of socio-economic activities to the Internet and the decline in the cost of data collection, storage and processing, are leading to the generation and use of huge volumes of data – commonly referred to as “big data”. These large data sets are becoming a core asset in the economy, fostering new industries, processes and products and creating significant competitive advantages. The infrastructure backbone of the digital world is bringing affordable broadband to billions of consumers. In parallel, low-cost connected devices are being deployed in every industry, and cloud computing, and the vast information-processing machinery it requires, is developing quickly.

Economic benefits: The economic benefits to be captured through digitization are real. A wave of capital has poured into the new digitization technologies and companies, and the public markets reward early movers with unprecedented valuations.

The influence of digitization is moving quickly through every company. Digitization is not just the adoption of new technologies, but the resulting transformation of life and work. Today’s new technologies, such as the cloud and big data are rapidly being woven into the fabric of business, as other technologies were before them. This is having a more dramatic effect than many people realize — not just on their customers, but on the industry that supplies these tools.

The figure 2 shows the objectives of digital business and various metrics to measure it. The chart shows that it is not only to do business in digital way but brings significant values to the business such as creating: new customers, new products, new marketing channels, new pricing models, improved manufacturing and process efficiency. A digital business can create revenue and results by using innovative strategies, products, processes and experiences. Companies may not be able to realize digital ambitions if they continue to be shackled by the cost, complexity and limited capacity of their legacy infrastructures (figure 2).

Figure 2. The value and impact of digital

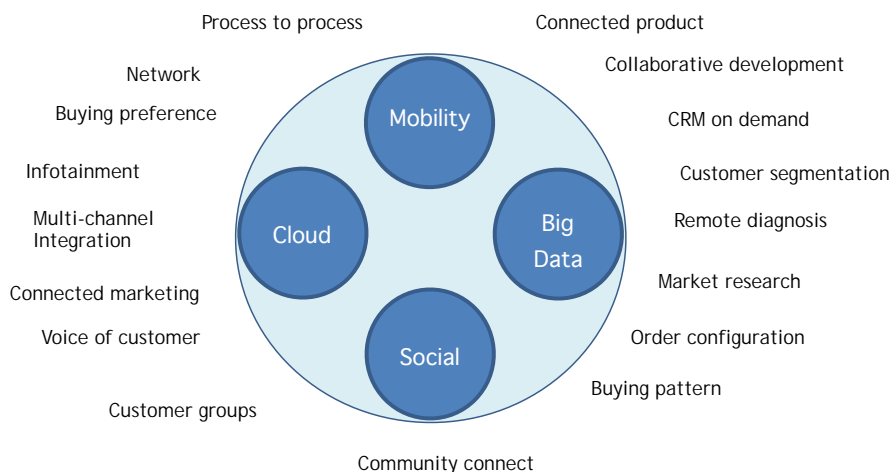


Source: McDonald and Mcmanus (2014)

The various components of a digital wave in a company can be broadly divided into four parts: Mobility, Cloud, Big Data, Social. This can be divided into several sub-groups as seen in figure 3.



Figure 3. The various component of digital



Source: Tata Consultancy Service (2014)

### 1.3. Digitalization of chemical industry.

Shifting business requirements in the chemical manufacturing and oil refining industries are driving new trends and requirements in information technology (IT) architecture.

To be a digital chemical company is no different. Chemical companies have an opportunity to turn their digital capabilities into a competitive advantage that will create a digital divide in the industry. To get the most from digital systems, chemical companies need to manage the context in which the systems are used; that is, to transform the business to take full advantage of new technologies throughout the value chain (Table 1).

Accenture (2014) has identified seven elements fundamental to harnessing digital capabilities for greater business outcomes. By understanding and working through these phases, chemical companies can put themselves in position to take advantage of today's digitally enabled solutions.

Table 1. Chemicals digital value chain

R&D / Laboratory	Plant Development and Investment	Material Sourcing and Acquisition	Product Manufacture	Inventory Management and Distribution	Sales Management
Co-innovation	Portfolio management	Collaboration and integration with suppliers	Plant automation	Automated warehouse and route management	Connected consumers
Closed-loop digital product lifecycle	Planning agility	Supply-volatility analytics	Resource optimization	Track and trace	Customer analytics
Product sustainability	Project finance	Commodity risk management	Remote monitoring	Collaboration with third-party service providers	Differentiated customer service
Virtual prototyping	Project execution and monitoring	Inventory and demand balancing	Asset performance	Inventory visibility	Dynamic pricing
			Quality automation		Execution compliance
			Track and trace		

Source: Accenture (2014)

Table 2. Digital Landscape in chemical Industry

Digital plant	Digital sales and marketing	Digital supply chain	Digital capital projects	Digital organization	Digital Marketplace presence
Combines value chain integration with increased digitalization across the value chain for more efficient and profitable operations	Improves planning integration to discover and exploit new revenue and profitability opportunities according to market updated relevant information	Digitalization of stock and fleet management across the value chain	Includes a digital portfolio strategy that simulates financial and operations scenarios, evaluates bottlenecks, interdependencies and digital capital project execution	Leverages digital technologies to improve enterprise function efficiency through better visibility, financial performance and workforce collaboration	Using digital tools and capabilities to maintain an ongoing presence in the digital marketplace to identify and capture opportunities and mitigate risk

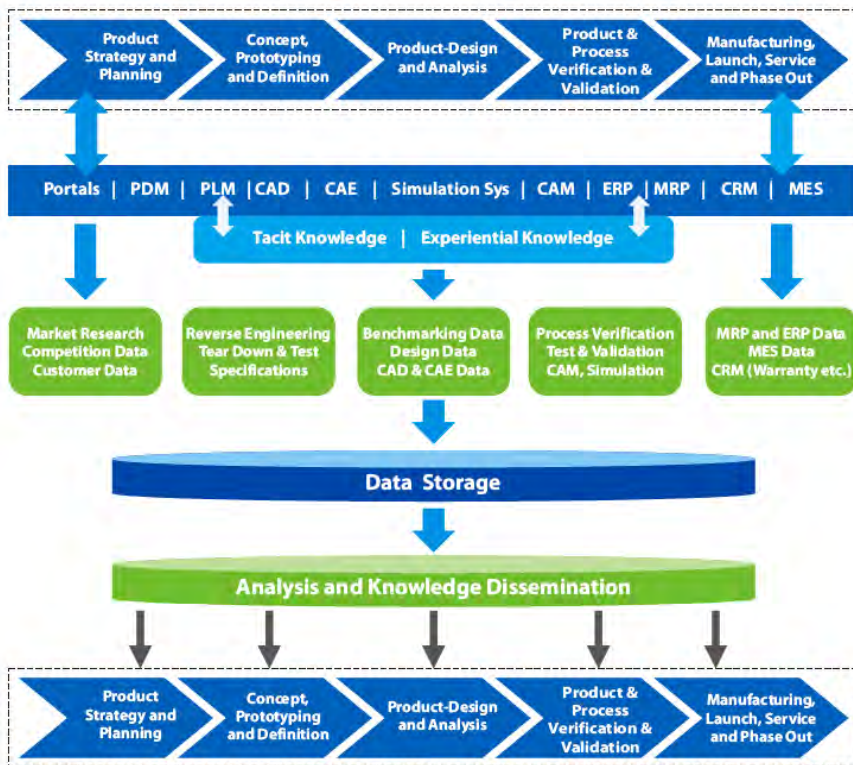
Source: Author

A Big Data strategy requires the ability to sense, acquire, transmit, process, store and analyze the data to generate knowledge that can be stored in a repository for later use.

The figure 4 below shows the full infrastructure of a Big Data and how is it integrated with the new product development process. The first row

of the chart shows the new product developments process. It is integrated to various portals and platforms from which the data are collected and stored. The data is then analyzed and fed back to the product development process.

Figure 4: Big data and data analytics for new product development



Source: Tata consultancy service (2013)

#### 1.4. Innovation in Marketing in Chemical companies: Digital Marketing

Digital technology is changing all. Consumers who used to seek out family and friends for word-of-mouth product recommendations now read online reviews, compare features and prices on Websites, and discuss options via social-networking sites. This information flow not only empowers consumers but also allows marketing departments to be part of the conversation consumers have as they actively learn about product categories and evaluate choices. Digital technologies drive change from

the outside in. Technologies such as mobility, analytics, social media and cloud are intrinsically customer-focused, giving customers the information and connections to change the meaning at every moment of truth. Growth is no longer a matter of creating new products and marketing playbooks that move customers through linear purchasing processes. By coordinating the consumer's end-to-end experience, companies could enjoy revenue increases of 10 to 20 percent as shown in table 3.

Table 3. Trends in customer engagement to increase sells

Capture	Increase	Capture	Build	= Increased online
Internet Traffic	Consumer	Qualified Leads	Consumer	revenue
	Engagement		Loyalty	
Capture	Meet or exceed	Convert 10-15	Build 60 %	Earn 10-20 % of
50-100% of	50 % of best	% of engaged	loyalty rate.	total incremental
fair-market	competitor's	traffic into	Achieve 40 %	revenue from new
share of traffic	engagement	qualified leads	sales	and loyal
	rate	Convert 20 %	conversion	customers through
		of loads into	rate annually	online channels
		sales	from loyalists	

Source: Accenture (2014)

Moving from a one-way, company-driven sales mentality to a two-way relationship with consumers requires core changes in the way marketers do business. Companies are buying thousands of search terms across their lines of business, and new agencies keep popping up to serve marketers' increasingly keen desire for innovative content, user tools, or social experimentation.

### 1.5 Digital Marketing Strategy

As many other industrial sectors, digital marketing in the chemical sector has the website as the core component of their digital marketing innovation. Website could be textual, visual or aural content that is encountered in a website. It may include text, images, videos, sounds and animation. It is seen all the top chemical companies have an elaborate website which is the window for information of the company to the outside world. When the website of these companies were analyzed in

details, seven key components were observed: Search Engine Optimization, Pay per click, Development, Social Media, Content Management, Additional Marketing, Content, Social Media, software. For our current study, we have focused on three digital marketing tools which are being extensively used in chemical industry: Blogging, Article Marketing, E-commerce, social Media Marketing. These are all components of marketing innovation.

Each of the components of the digital marketing can be sub-divided into several sub components. These sub-components are shown in table 4.

Table 4. Sub-components of the digital marketing relevant to chemical industry

Search Engine Optimization (SEO)	Development	Pay-per-click (PPC)	Social	Software	Additional Marketing	Content
Link Building	QMS	Search	Facebook	Technologies	CFO	PR
Multi-lingual	Mobile	Ad Schedule	Twitter	Reporting	Shopping Feed	Blogs
On Page	Bespoke	Mobile	Linkedin		Cookie / Audit Law	Articles
Mobile	Design	Display	Youtube		EmailMarketing	Content
Local			Google+			
			Other			

Source: Author

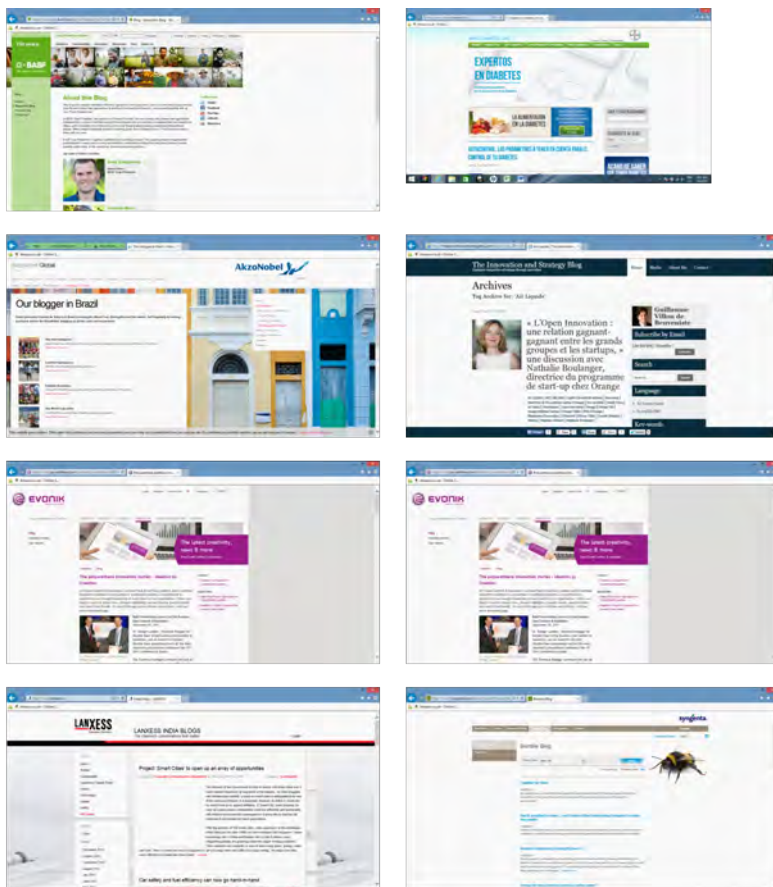
Figure 5. Various components of digital marketing strategy of a chemical company



Source: Author

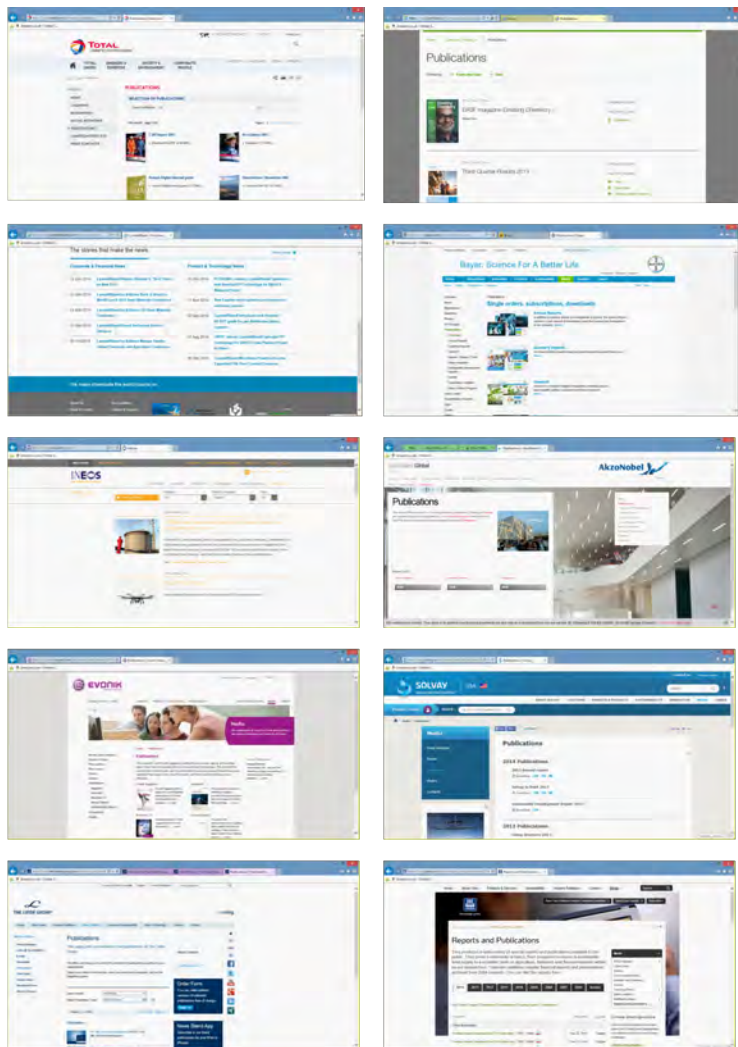
The figure 6 below show extracts of the blogs of some of the top chemical companies. It is seen that the companies have their own blogs while some of them have blog for specific business and also specific products.

Figure 6. Website with blog web page



Source: Individual company webpages (2014)

Figure 7. Article and publication web pages of the top chemical companies



Source: Individual company webpages (2014)

Article marketing is a type of advertising in which businesses write short articles about themselves, their company or their field of expertise

as a marketing strategy. Internet article marketing is used to promote the authors expertise of their market, products or services online via article directories. Article directories with good web page ranks receive a lot of site visitors and may be considered authority sites by search engines, leading to high traffic. These directories then give PageRank to the author's website and in addition send traffic from readers.

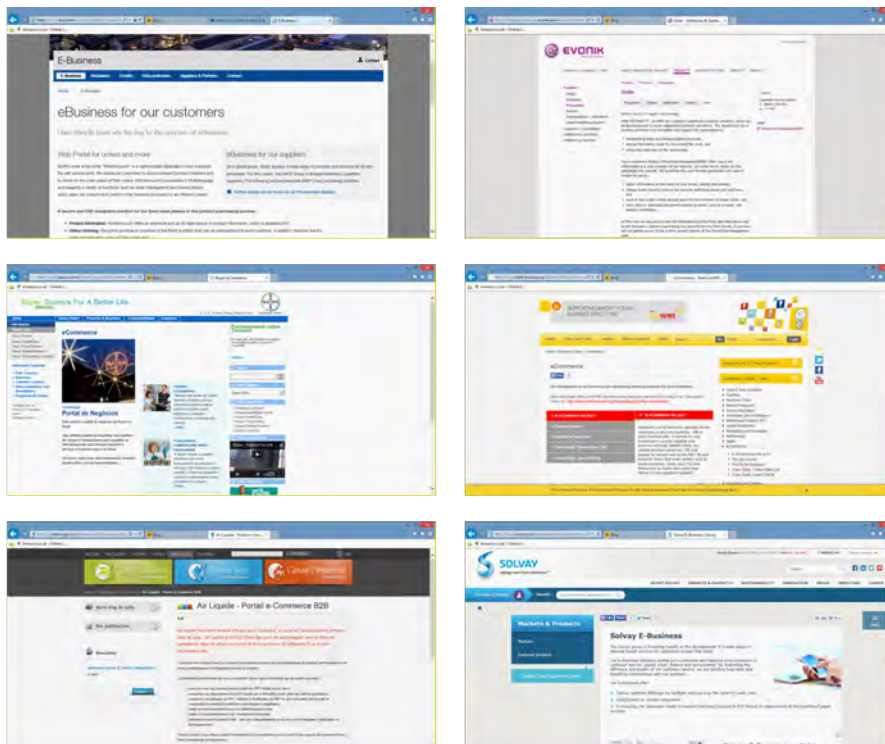
Articles and article directories attract search engines because of their rich content. Business Owners, Marketers and Entrepreneurs attempt to maximize the results of an article advertising campaign by submitting their articles to a number of article directories. However, most of the major search engines filter duplicate content to stop the identical content material from being returned multiple times in a search engine results page. The figure 7 shows screen shot of the article page or publications of the top chemical companies under study.

Electronic commerce, commonly known as E-commerce or ecommerce, is trading in products or services using computer networks, such as the Internet. Electronic commerce draws on technologies such as mobile commerce, electronic funds transfer, supply chain management, Internet marketing, online transaction processing, electronic data interchange (EDI), inventory management systems, and automated data collection systems. Modern electronic commerce typically uses the World Wide Web for at least one part of the transaction's life cycle, although it may also use other technologies such as e-mail. It is seen that the top chemical companies in Europe has in most case e-commerce website where they sell some of their products (figure 8).

Social media marketing refers to the process of gaining traffic or attention through social media sites. Social media often feeds into the discovery of new content such as news stories, and “discovery” is a search activity. Social media can also help build links that in turn support into SEO efforts. Many people also perform searches at social media sites to find social media content. Social connections may also impact the relevancy of some search results, either within a social media network or at a ‘mainstream’ search engine.



Figure 8. E-commerce web page of the top chemical companies



Source: Individual company webpages (2014)

Social media marketing programs usually center on efforts to create content that attracts attention and encourages readers to share it with their social networks. A corporate message spreads from user to user and presumably resonates because it appears to come from a trusted, third-party source, as opposed to the brand or company itself. Hence, this form of marketing is driven by word-of-mouth, meaning it results in earned media rather than paid media. It is seen that all the top chemical companies are involved strongly in social media marketing.

The table 5 shows the study of the top chemical companies websites and the social media link available on their website. All the companies under study is seen to be focused on social media marketing having involved with top five social media: Facebook, Twitter, LinkedIn, Google+,

YouTube. Many of them also have a RSS Newsfeed which provides latest updates of the companies (table 5).

Table 5. Active involvement of social media channels by the top European chemical companies

	Face- book	Twitte r	Linkedi n	Google +	You Tube	Flickr	Slideshar e	Insta- gram	Xing	Pinterest	RSS Newfeed
BASF	X	X	X	X	X	X					X
Shell	X	X	X	X	X	X					
LyondellBasell	X	X	X	X	X						
Bayer	X	X	X	X	X						X
IneosGroup	X	X			X						X
Akzo Nobel	X	X		X	X	X	X				
Air Liquide		X	X								X
Evonik	X	X	X	X					X		
Solvay	X	X	X		X						
Linde	X	X	X	X	X				X		
Yara	X	X	X		X		X				X
DSM	X	X	X	X	X						X
Lanxess	X	X			X						
Syngenta	X	X	X		X						X
Arkema	X	X									X
Eni	X	X	X	X	X	X	X	X		X	
Styrolution		X	X	X	X						
Total	X	X									X

Source: Author

Table 6 shows the activities of top chemical companies in various social media domain. Since all of them have Facebook page, “likes” on the Facebook was taken as important statistics for analysis. Shell leads the list with over 5 million likes, followed by Total as distant second and Bayer as the third. In terms of Tweets, Total is the leader followed by Syngenta and DSM. In terms of followers on Twitter, Bayer is the leader with over 101000 followers. YouTube has established itself has a strong social media channel through video. Most of the chemical companies under study have YouTube channel and it is seen that shell has highest numbers almost 24000 subscriber followed by BASF with almost 5000 subscribers.

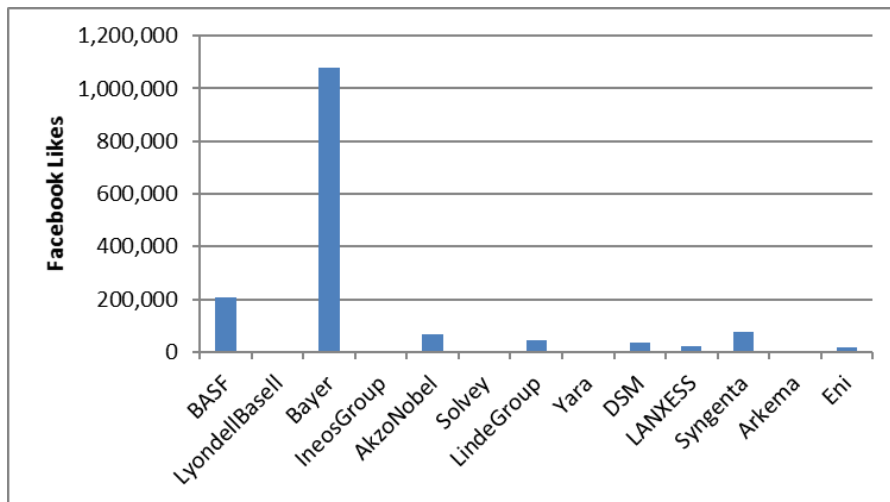
Table 6. Degree of engagement of top chemical companies in various social media channels

As on 21-11-2014	Facebook	Twitter					LinkedIn	Google+		Youtube
	likes	Tweets	Following	Followers	Favorites	Lists	Followers	Followers	Views	Subscribe
BASF	208.562	2.590	683	26.4k	364	6	268.993	3.322	1.455.859	4806
Shell	5.375.981	1.632	130	260k	8		1.236.175	229.306	2.241.993	23.941
LyondellB asell	1.312	313	1.964	3.355	18	1	31.762	75	35.270	38
Bayer	1.079.279	1836	1801	101k	1.362		310.454	1958	689.256	910
Ineos Group	609	410	186	3.599	3					183
Akzo Nobel	67.016	1.428	682	11.3k	84			608	281.715	776
Linde Group	45.575	1.395	1.232	5.640	181	6	49.652	544	266.996	705
Yara	4.419	2.398	1.367	3.647	175		49.652			756
DSM	37.337	5.481	437	66.7k		1	55.617		311.772	1.071
LANXESS	23.063	900	95	3.092	305	1				232
Syngenta	76.799	5.920	1.521	33.9k	5.786	4	82.148			
Arkema	1460	546	233	2.409	2	10				
Eni	16.830	2.115	397	14.1k	518	1	178.037	122	85.620	3.847
Styro lution		21	6	52	7		65	17	2.560	18
Total	2.042.088	7.133	371	52.1k	109					

Data Source: Individual Websites; Author's calculation

Figure 9 shows a comparative graph as how the Facebook page is liked by the visitor. It is seen that Bayer is way ahead of most of the chemical companies and seen to be very active in their Facebook website. Distant second is BASF while the activity of others were pretty low. This shows that even though every chemical company has a Facebook page, they are not very active there and do not emphasize the importance of Facebook marketing. On the other hand, the oil companies even though not appearing in this graph are way ahead of chemical companies in terms of activity at the Facebook page.

Figure 9. Facebook likes of various chemical companies



Source: Author

Information technology challenges faced by the Chemical Industry in Europe. Chemical companies have specific concerns relating to cyber security, supply chain and logistics. At the same time, trends like big data, cloud computing and social media have begun to exert an influence on the industry. Chemical companies are moving in and out of markets as their strategy dictates, so portfolio churn is an issue. Margins are tight, so mitigating costs is on the list. Data management and security, especially in new markets, is a concern. Global regulation is another. And while everyone has a basic ERP system, companies are looking upstream and downstream in their value chain, trying to find ways to reduce costs and increase margins.

According to Ray Adams (IBS Chemicals Solution Manager at SAP), IT is helping to integrate groups like R&D to drive down cycle times in the product development and commercialization process. Some segments like coatings and ink companies introduce hundreds of products each year. They have to commercialize these things quickly. IT provides the tools and mechanisms to make that as seamless as possible, integrating into finance, the regulatory environment, into environmental health and safety databases, and flowing into the manufacturing environment.

## CONCLUSIONS

From the above study the following conclusions can be drawn:

Large chemical companies are adopting digitalization at very high pace. The consumer pull, technology push and economic benefit digitalization brings led the larger chemical companies, particularly in Europe to adapt it in their main stream of business. The two pillars of digitalization of a company are digital operation and digital marketing. The drivers for the operational digitalization in larger chemical companies are: very complex supply chain, drive to innovate at very high pace, employee inclined to new technologies, new regulatory requirements and very fast information technology growth. The digital value chain in chemical industry has become very complex starting from R&D laboratory and ending in sales management.

Digitalization and big data analytics are driving innovation for both product and marketing. In case of most chemical companies, it was evident that the data collected from the customer was feed into the product development system. This data once fed into the data base is extracted into meaning decision making process through big data analytics.

The larger chemical companies in Europe have adapted digital marketing as the innovative method of promoting their products and services. The current study shows that digital marketing is playing a key role in chemical industry in influencing purchasing decision both in case of business-to-consumer (B2C) and business-to-business (B2B). The study also showed that the purchasing decision no more follows a vertical stereotype path and follows a more inter-active route until the decision is made. The chemical companies which have been selling through traditional methods are moving to online tools. Several of the large companies we studied have an ecommerce website where they are selling their products. It should be mentioned here that the business to business sell is still done in the conventional method while business to consumer sell is moving more towards online. All the companies we studied have a very detailed website and every effort is being made to capture the internet traffic. Software tool such as search engine optimization (SEO) is used extensively by these companies to drive more traffic to their websites which can eventually lead to increase in consumer engagement, capture qualified leads, build consumer loyalty and ultimately bring in sell. Although being late, the chemical industry is catching up in case of social

media marketing. Every company we researched is involved in more than one social media in order to promote their product. Facebook has been the first choice for most of the companies and have on YouTube a dedicated video channel which is regularly updated with product or company related promotional video. We also found that these social media channels have a huge fan following, but it was difficult to know if they were employees or dedicated customers or just general public. Another aspect of digital marketing they all are focused on is blogs and article marketing.

## REFERENCES

- Accenture, (2014). The Digital Chemical Company. Retrieved from <http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-The-Digital-Chemical-Company-Infographic.pdf>
- Air Liquide. (2015). Welcome> Air Liquide in China. Retrieved from <http://www.cn.airliquide.com/en/welcome.html>
- AkzoNobel. (2014). Planet Possible: Our commitment to doing more with less. Retrieved from [https://www.akzonobel.com/sustainability/planet\\_possible/](https://www.akzonobel.com/sustainability/planet_possible/)
- Arkema. (2015). The Arkema group – a partner of the oil and gas industry. Retrieved from <http://www.arkema.com/en/products/markets-overview/oil-and-gas/index.html>
- BASF. (2015). Strategy and Organization. Retrieved from <https://www.basf.com/en/company/about-us/strategy-and-organization.html>
- Bayer. (2015). Bayer's Products for Humans ,Animals and Plants. Retrieved from <http://www.bayer.com/en/Products.aspx>
- Brown, S. and Eisenhardt, K. (1995). Product development: past research, present findings, and future directions. *Academy of management review*, 20 (2), 343-378
- DSM. (2015). Bright Science. Brighter Living. Retrieved from <http://www.dsm.com/corporate/about/bright-science-brighter-living.html>
- Eni. (2015). Eni Boosts Norway Exploration Activity with 2 New Licenses - Analyst Blog  
Retrieved from <http://www.nasdaq.com/article/eni-boosts-norway-exploration-activity-with-2-new-licenses-analyst-blog-cm435717#ixzz3V8vtTYEA>

- Evonik Industries. (2015). The polyurethane innovation stories - Ideation to Creation. Retrieved from <https://www.pu-additives.com/product/pu-additives/en/creativity/blog/pages/blog.aspx>
- Friedrich, R., Koster, A., Groene, F. and Maekelburger, B. (2013). The 2012 Industry Digitization Index. Retrieved from Booz&co corporate website <http://www.strategyand.pwc.com/global/home/what-we-think/digitization>
- Han, J., Kim, N. and Srivastava, R. (1998). Market Orientation and Organizational Performance: Is Innovation a Missing Link? *Journal of Marketing* (62), 30-45.
- Ineos Group. (2015). INEOS Bio. Retrieved from <http://www.bayer.com/en/Products.aspx>
- I-Scoop. (2015). Corporate blogging guide: strategy and tips. Retrieved from <http://www.i-scoop.eu/corporate-blogging-business-blogging/>
- Lanxess. (2015). Green Chemistry to be Discussed by Lanxess and Zenith in Hong Kong . Retrieved from <http://www.blcleathertech.com/blog/green-chemistry-to-be-discussed-by-lanxess-and-zenith-in-hong-kong/2015/02/19/>
- LindeGroup. (2015). Clean Energy – A Global Megatrend. Retrieved from [http://www.the-linde-group.com/en/clean\\_technology/clean\\_energy/index.html](http://www.the-linde-group.com/en/clean_technology/clean_energy/index.html)
- Lyonell Basell.(2014). LyondellBasell Remains on Track with Ethylene Expansion - Analyst Blog. Retrieved from <http://www.nasdaq.com/article/lyondellbasell-remains-on-track-with-ethylene-expansion-analyst-blog-cm456845#ixzz3V8YuyEeK>
- McDonald, M. and McManus, R, (2014). Growth Strategies for a digital World. New York, Accenture. Retrieved from: <http://www.accenture.com/us-en/Pages/insight-growth-strategies-digital-world.aspx>
- Schumpeter, J. (1934). *The Theory of Economic Development*. Cambridge, Massachusetts: Harvard University Press.
- Shell Global. (2015). The Shell global homepage. Retrieved from <http://blogs.shell.com/climatechange/>
- Solvey. (2015). Innovation: Solvey. Retrieved from <http://www.solvey.com/en/innovation/index.html>
- Styrolution. (2015). Corporate Governance- styrolution. Retrieved from [https://www.styrolution.com/portal/en\\_US/web/guest/corporate-governance](https://www.styrolution.com/portal/en_US/web/guest/corporate-governance)

- Syngenta. (2015). Syngenta helps growers around the world farm more productively with a broad range of innovative products. Retrieved from <http://www.syngenta.com/global/corporate/en/products-and-innovation/Pages/products-and-innovation.aspx>
- Tata Consultancy Service. (2014). Digitalization The way Forward for Automotive Industries. Retrieved from <http://www.tcs.com/SiteCollectionDocuments/White%20Papers/Digitization-Way-Forward-For-Auto-Companies-0913-1.pdf>
- Tata Consultancy Service. (2013). Managing Knowledge from Big Data Analytics in Product. Retrieved from [http://www.tcs.com/resources/white\\_papers/Pages/Knowledge-Big-Data-Analytics-Product-Development.aspx](http://www.tcs.com/resources/white_papers/Pages/Knowledge-Big-Data-Analytics-Product-Development.aspx)
- Total. (2015). The Total Homepage-Oil, Natural and Solar Energy Company. Retrieved from <http://www.total.com/en/>
- UNESCO. (2012). Measuring innovation: Main definitions & indicators. Retrieved from <http://www.uis.unesco.org/SiteCollectionDocuments/Measuring%20innovation.ppt>
- Yara. (2015). Research and development. Retrieved from <http://www.yara.com/about/research/index.aspx>





---

# Chapter 7

---



## Innovation of Sustainable Products and Services through Ecodesign Project Management by applying SINNAPS

*By Lucio Guzmán-Mares, Ma. Soledad Castellanos-Villarruel,  
David Fernández-de la Puente and Salvador F. Capuz-Rizo*



# Innovation of Sustainable Products and Services through Ecodesign Project Management by applying SINNAPS

Lucio Guzmán-Mares

Ma. Soledad Castellanos-Villarruel

Universidad de Guadalajara, México

David Fernández-de la Puente

SINNAPS, España

Salvador F. Capuz-Rizo

Universitat Politècnica de València, España

## INTRODUCTION

The development process of products and services is increasingly being considered a success key factor for companies. New information technologies drove this change in product design in the first decade of the XXI century and the integration of environmental and social aspects is the new challenge. This goal can only be achieved with innovation management.

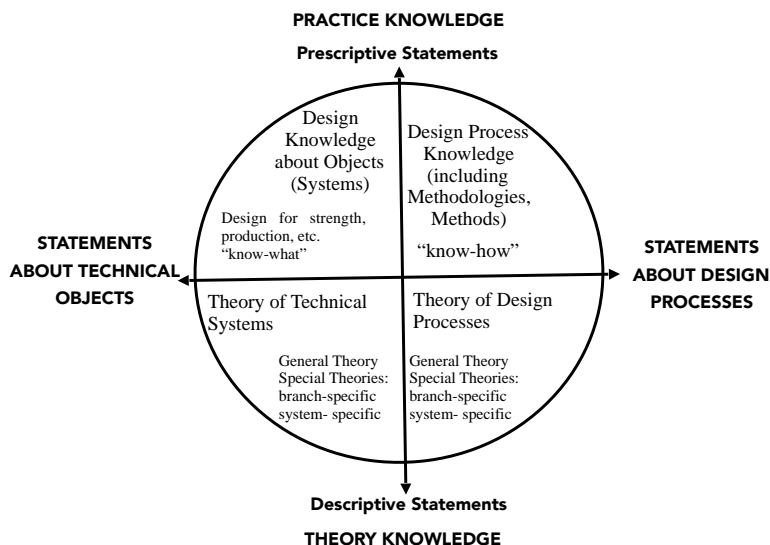
OECD, in its Frascati Manual (1994), defines innovation as “the transformation of an idea into a marketable product or service, a new or improved operative manufacturing or distribution procedure, or a new method for providing a social service”. In this case, the concept is clearly linked to business innovation. There are lots of definitions and explanations for the term innovation, linked to the economic field, the sociological field, etc., but ultimately all of them have the implicit meaning that: “to innovate means to introduce modifications in the way of doing things, in order to improve the final result. Thus, an innovation can be, from an article price modification in order to conquer a market, to the improvement of an old product or the discovery of a new application for an existing product” (González, 2006).



## 1. THE DESIGN SCIENCE

Knowledge related to engineering design can be structured, categorized and classified through the so called Design Science (Eder, 1995), which has the potential for clarifying and rationalize design practice.

Figure 1. Design Science dimensions (Hubka & Eder, 1988).



The scope of this chapter is located in the southeast quadrant, because its aim is to develop a design and management methodology in order to enable environmental aspects integration in products and services development. This quadrant includes (Eder, 1995):

- Design process models, intuitive elements and systematic design procedures, progressive development of the information regarding the system being designed, problems resolution, decision processes, etc.
- Design activities hierarchy, conceptualization-formalization-detail, etc.
- Applicability to different design situations.
- Designers' nature, psychological profile and attitudes, teamwork, social factors, etc.
- Information needs availability, relations, etc.

- Product management and planning, design process management and documentation, information storage and recovery, etc.
- Related subjects: motivation, creativity, invention and innovation.
- Work principles and methods, intuition and the “art” of design, intuitive and formalized methods and methodologies, tools, etc.
- Relationships with other techniques, methods and methodologies.

According to several authors (Ferrer, 2004), the integration of environmental considerations to design will not necessarily introduce great changes in the product design process basic structure. This process (Alston et al., 1999) imposes that the traditional “wall” that in some sense existed between design and manufacture must be overcome. By extension, sometimes the term “green wall demolition” is used to describe Ecodesign implementation in a company.

Table.1 A comparison of engineering design process models

	Andreasen & Hein (1987)	Olsson (1985)	Pugh (1991)	Pahl & Beitz (1996)	Ullman (1997)
Phase 0	Recognition of Need	Need	Market	Task	Identify needs
Phase 1	Investigation of Need	Product Type	Specification	Planning and Clarification of Task	Develop engineering specifications
Phase 2	Product Principle	Product “in Principle”	Concept Design	Conceptual Design	Develop Concept
Phase 3	Product Design	Primary Product	Concept Design	Embodiment Design	Develop product
Phase 4	Product Preparation	Preparation of the Production	Detail Design	Detailed Design	Develop product

Source: Adapted of Howard et al. (2008).

From the analysis performed by Professor Ferrer (2004) in his doctoral thesis, of the leading authors who have developed design models and methodologies, and including subsequent contributions, the following considerations can be highlighted. In conclusion (Alcaide et al., 2001), any design begins, or should begin, with a detected need or even a created need inside an existent or potential market. From the proposition of this need, and after a market research work, product design specifications are formulated, which are the guidelines for the entire product design process.

## 2. AN APPROXIMATION TO INNOVATION EVOLUTION

The different industrial revolutions of mankind have had innovation as a transverse engine. Transit from one revolution to another have generated new products and processes that stand out in each period and contribute to social development and growth, thus beginning new economic cycles. The term innovation has always existed in the economic and engineering studies and business success has been attributed to innovation. Although innovation's first concepts revolved around machinery invention and technique developments for their use, its evolution has reached the point of conceiving it as a process and a new business management form for marketing, products and services (Quiroga et al., 2014).

A dilemma has existed through time between invention and innovation. For Schumpeter (1978), an invention is a product or process born from science (scientific field), and innovation is related with the economic aspect, because through it income is generated. Therefore, for an innovation process to be efficient and continuous, it must have as a central point the transformation of information into knowledge, through organizational learning arising from the company, suppliers and clients. Furthermore, Getec (2005) outlines five types of innovation: according to the innovation object or form (products, services or processes); according to its impact (determined by consumer needs); according to its effect; according to the scale in which the innovation process is performed and according to the innovation origin.

The Oslo Manual (2005) defines four innovation types: product innovation (introduction of new or improved goods or services); process innovation (implementation of a new or improved production or distribution method); marketing innovation (new commercialization method, improvements in product design, positioning, promotion or price); and organizational innovation (new business practices). Previously, Schumpeter (1978) had distinguished five types, the new product or service introduction, the use of a new source of raw materials, the opening of a new market, the development of new production methods and the creation of new market structures.

Innovation is the way to achieve high competitiveness levels in the globalization current processes, for it allows intervening saturated markets, fulfilling client needs and expectations and meeting high demands. It must become an organizational strategy for it to obtain the desired results, studying and assessing the resulting risks, making

exhausting studies of innovation needs and how the organization will cope with it (Maña, 2000).

Table 2. Innovation typologies

INNOVATION TYPES	
By its nature or object..... .....	<ul style="list-style-type: none"> <li>• Product innovation (good or service).</li> <li>• Process innovation</li> <li>• Innovation in the commercialization methods or techniques (commercial).</li> <li>• Innovation in management methods or techniques.</li> <li>• Organizational innovation</li> </ul>
By its novelty degree.... .....	<ul style="list-style-type: none"> <li>• Radical or rupture innovation</li> <li>• Incremental innovation</li> <li>• Adaptative innovation</li> </ul>
By its economic impact.... .....	<ul style="list-style-type: none"> <li>• Basic innovation</li> <li>• Improvement innovation</li> </ul>

Source: (Benavides, 1998).

Table 2 shows the innovation typologies, in a condensed form. This chapter is centered on the innovation typology called “by its nature or object” with every one of its subclasses.

### 2.1. Business innovation and ecoefficiency

Ecodesign application, that is, the introduction of environmental considerations in the design process, implies a strategic change in the company. It is linked with innovation and new work organization cultures that apply interdisciplinary participation of all departments in the ecoproducts development process. This process can change when Ecodesign is associated with innovation and ecoefficiency (reduction of environmental impacts and productive process costs) (Rieradevall, 2010).

With Ecodesign techniques, environmental criteria are introduced in design, trying to minimize the most important environmental impacts derived from production and consumption of the generated good (Capuz and Gómez, 2004). Design considers the interrelationship between values assigned to aesthetics, costs, functionality, safety, quality and ergonomics. The objective of the design techniques is to incorporate in the same order of importance, production traditional criteria with the new environmental notions, in order to reduce environmental impacts, both in raw material selection and in manufacturing and throughout the offered good's life cycle.



### 2.3 Products and services sustainability

At the start of an Ecodesign project, the designer identifies those actions that can contribute to achieve a higher degree of environmental improvement. These potential actions are then prioritized from a technical and economical point of view. Actions that directly influence costs reductions for the manufacturer (raw materials usage reduction, less containers and packaging, more efficient distribution logistics, etc.) are easy to apply (Fernández, 2015).

Table 3. Success Factors for Integration of Ecodesign in Product Development.

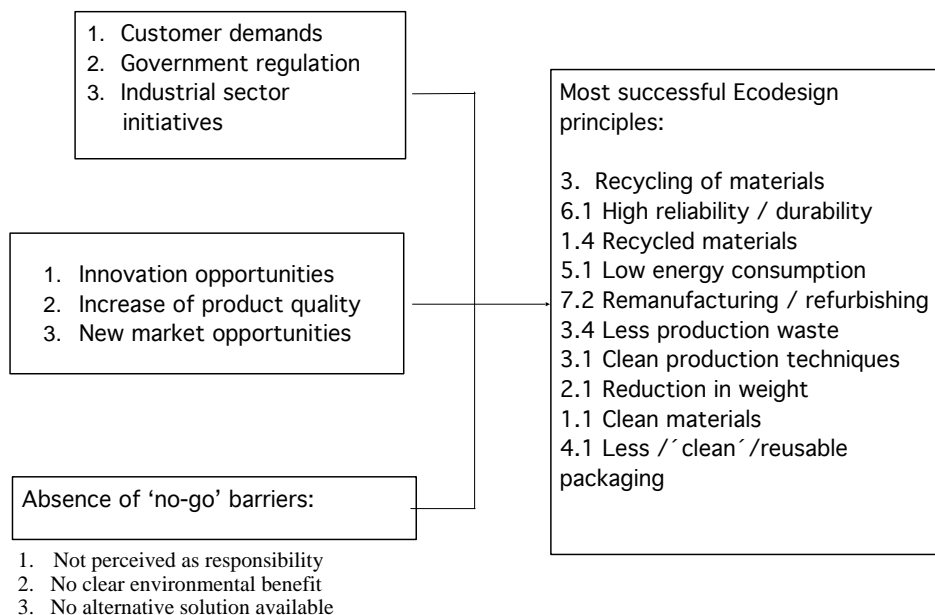
Area of Concern	Success Factors
Management	Commitment and support are provided
	Clear environmental goals are established
	The environmental issues are addressed as business issues
	Ecodesign is not only treated at an operational level, but also at an strategic level
	Environmental issues are included when establishing a company's technological strategy
Customer Relationships	A strong customer focus is adopted
	Companies train their customers in environmental issues
Supplier Relationships	Close relationships with suppliers are established
Development Process	Environmental issues are considered at the very beginning of the product development process
	Environmental issues are integrated into the existing product development process
	Environmental checkpoints, reviews and environmental milestone questions are introduced into the product development process
	Company-specific environmental design principles, rules and standards are used
	Ecodesign is performed in cross-functional teams
	Support tools are applied
Competence	Education and training are provided to the product development personnel
	An environmental expert supports the development activities
	Examples of good design solutions are utilized
Motivation	A new mindset emphasizing the importance of the environmental issues is established
	An environmental champion exists
	Individuals are encouraged to take active part in the integration of Ecodesign

Source: (Johanson, 2002).

Johansson (2000) also offers an interesting state of the art revision regarding Ecodesign success factors (Table 3). It emphasizes the fact, which is logical, that these factors for the most part, coincide with influence factors in the product development conventional process.

Other research works have intended not only to identify all the influencing factors, but also to put them into a hierarchy. For instance, in the Netherlands, based on surveys administered to seventy four SMEs (Van Hemel, 2002) the most influential stimuli and barriers to Ecodesign were identified, as well as the most successful Ecodesign principles (figure 2).

Figure 2. The most influential stimuli and barriers, and the 10 most successful Ecodesign principles



Source: Van Hemel, 2002

### 3. METHODOLOGIES FOR ECODSIGN AND SUSTAINABLE INNOVATION.

#### 3.1. Ecodesign: key stage in the product sustainability process.

On the road to sustainable development, there are different action phases that help reducing products impact. On the one hand, there are

isolated actions such as emissions treatment during a product manufacturing process, or final waste materials treatment. On the other hand, there are also global environmental prevention actions, such as sustainable Ecodesign, which aims to integrate environmental aspects (ecology), social aspects (equity) and business aspects (economy). In this context, Ecodesign is the key link towards sustainability and responsible consumption, because it incorporates new concepts such as: product-system vision, life cycle concept and integration of all stakeholders in the improvement of the environmental aspects in products and services.

There are different methodologies for Ecodesign management. Some of them are shown in Table 4, which have been created and applied in different sectors and countries.

Table 4. Comparison of different Ecodesign methodologies proposals phases.

BREZET (PROMISE) (1997)	Crul & Diehl (1999)	IHOBE (2000)	UNE IN ISO 14006 (2011)	GUZMAN (2005)	Rocha and others (2011)
Ecodesign Project organization	Organization and business strategy	Preparation of an Ecodesign project	Planning	Planning	Ecodesign project planning
Product selection	Product selection				Project analysis
Strategies setting	Product analysis	Environmental aspects			Product Ecodesign strategy definition
Ideas generation and selection	Generation of new ideas	Ideas for improvement			Product concept
Concept details	Detail the concept	Developing concepts	Implementation and operation	Implementatio n	Product in detail
		Product in detail			
Communica tion and launching	Results evaluation	Action plan	Verification	Evaluation	Production and launching  Project and product evaluation
		Evaluation			
Monitoring			Revision by Management	Improvement management	Monitoring activities

Source: Elaborated by authors.

The methodology developed by Guzmán (2005) will be taken as a basis for this chapter general objective, because it is oriented towards facilitating Ecodesign implementation through its integration with the rest of the business management systems.

### 3.2. Management of the Ecodesign introduction project in the company.

The introduction of Ecodesign in a company requires an organizational adaptation, as it is taken into account in the presented methodology. Also, each new product development, as well as the modification of an existent product will require a new project launching.

According to the International Project Management Association, the discipline of Project Management consists on planning, organizing, monitoring and controlling every project aspect. It also encompasses the motivation of every one of the project stakeholders, in order to achieve project objectives in a safely manner and meeting deadlines, costs and performance specifications. This also comprises the project leadership, organization and technical direction tasks needed for its proper development.

Recently, the first worldwide standard for project management has been developed by ISO. This standard, ISO 21.500:2012, in its Spanish version (ISO-AENOR, 2013), defines the direction and management of projects as the application of methods, tools, techniques and competences to development of a project. Project direction and management includes the integration of the different life cycle phases of the project. Project management is executed through processes. Processes selected to execute a project should be focused from a systemic point of view. Each phase of the project life cycle should have specific deliverables. These deliverables should be regularly revised in order to meet the project sponsor, clients and other stakeholders' requirements. In the development section of this chapter, the principles of project direction and management are applied (Cómez-Senent and Capuz, 1999) for the development of new ecodesigned products.

### 3.3. Sinnaps, a tool to facilitate project management.

Sinnaps is the intelligent project manager that facilitates complex project management, in which uncertainty plays a relevant role. It is designed to give advice to the professional in decision making, monitoring project evolution and suggest management improvements. To this end, it uses an exclusive rendering engine, which through PERT (Project Evaluation and Review Techniques) and CPM (Critical Path Method) logic

algorithms automatically optimizes work flows. It also allows a Project Manager to select the best planning for each moment. This way, it is possible to simulate and quantify the assumed risks impact using the Earned Value Management.

Sinnaps keys are: automatic planning, uncertainty management and advice for decision making.

### 3.3.1. Innovations of Sinnaps

- It is a tool capable of designing and optimizing work flows automatically, based on PERT and CPM. The planning of every project is presented through a Gantt diagram, called Gantt-flow, capable of representing the critical paths of a project, float time of activities and bottlenecks in a work flow.
- It intuitively projects resources consumption along the planning with the aim of facilitating their optimization.
- It interprets values and indicators based on Earned Value techniques (EVM) to suggest Project Managers how to improve the management of their projects.
- Different casuistries can be implemented in the same process and adapt them automatically to different projects.
- It allows the collaborative creation of processes.

Figure 3. Sinnaps: tasks and interrelationships in a project.



Thanks to its exclusive process rendering engine (see Figure 3) based on PERT techniques, Sinnaps is able to manage a great volume of tasks and their interrelationships in order to answer the following questions instantly:

- Which activities should be done and in what order to be as efficient as possible?
- How would the planning change if activities are added or removed?
- What happens to the project if dates of resources or tasks are modified?
- How much would cost each change in planning?
- Are there enough resources available to carry out this planning?
- How are activities related with each other?

The implementation and detection of Critical Paths (CPM) make Sinnaps (see figure 4) able to:

- Automatically optimize the planning of projects after every change.
- Determine activities priority.
- Identify the most important tasks, also called critical paths, in order to avoid delays.
- Detect bottlenecks or activities that determine the success of a project.
- Determine float times and delays that can be allowed per activity without affecting other activities or the project.

Figure 4. Implementation and detection of Critical Paths.

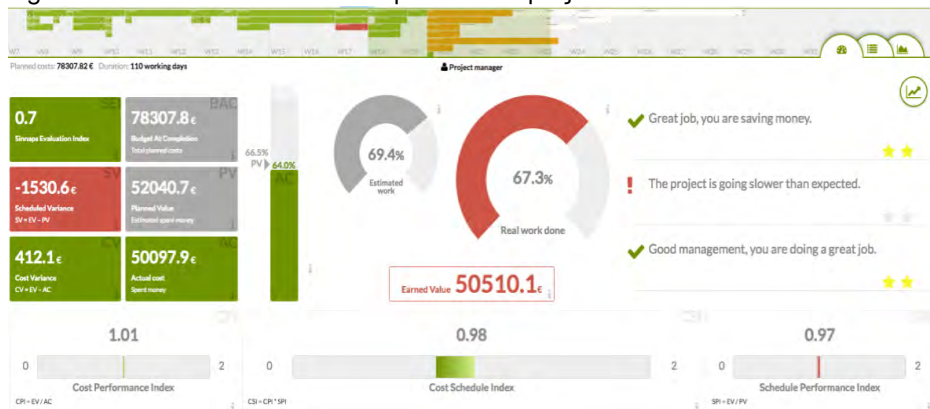


With the Earned Value Management (EVM), Sinnaps:

- Monitors and evaluates the development of the project in a continuous way and in real time.
- Quantifies and monetizes the impact of changes and potential scenarios.
- Counsels the Project Manager on the proper management of an on-going project (see figure 5).

Once a project is implemented, Sinnaps evaluates its evolution with EVM techniques (see figure 3), and, based on the best practices recommended by international project management associations, interprets objective indicators and suggests improvements on the management of a project.

Figure 5. Evaluation of the development of a project.



Finally, Sinnaps allows adapting planning to the actual resources availability for a project at a given moment. Therefore, the Project Manager can visualize the consumption of resources along the planning itself and benefit from the process renderer's power to project the consumption of each of them based on the proposed planning. This way, and with the Dynamic Data Visual Display, the Project Manager will be able to:

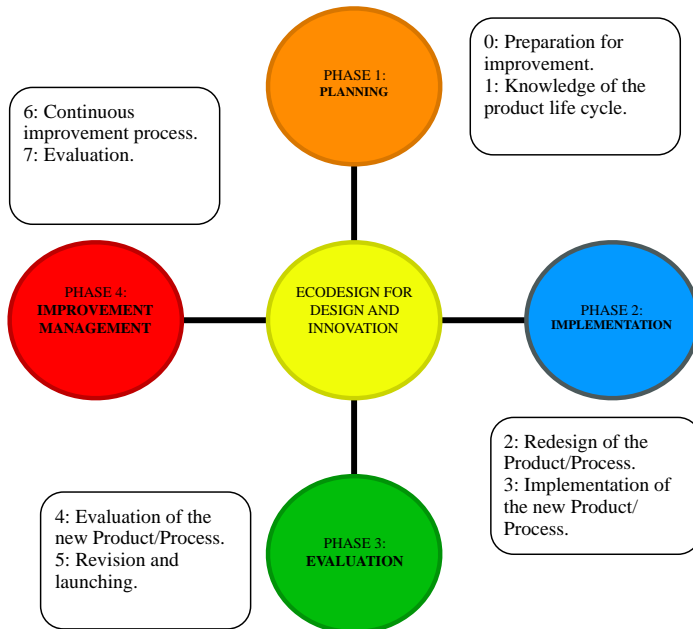
- Optimize project planning based on the availability of resources.
- Project resources consumption based on changes in planning and quantify their impact.

- Compare the allocation and imputation of resources based on different scenarios.
- Compare and project the estimated and actual resources consumption of a project.

#### 4. METHODOLOGY IMPLEMENTATION

In this section, the Ecodesign methodology proposed by Professor Guzmán (2005), for the design and innovation of products and services is presented, as well as its implementation through the application of the SINNAPS tool. For the assessment of the amount of resources and the duration of activities, a real example was developed in an industry of the furniture manufacturing sector in Jalisco (México).

Figure 6. General approach of the Ecodesign Methodology



Source: Guzmán, 2005

##### 4.1. General Description of the Methodology

The methodology is structured in four Phases and eight Stages (Figure 6). Next, on Table 5, the information on each of the phases with their corresponding stages and activities to be developed is shown, including



manpower and times to be introduced in SINNAPS. It is important to mention the necessity of holding an account on Sinnaps, since the capture of information is online and the information is saved on the site for its administration. If at any given time a personalized license or a company license is desired, the procedure with Sinnaps is direct and easily accessible.

Table 5. Estimated time and manpower for all activities.

Nº.	PHASE/STAGE ACTIVITY/TASK	PRECEDENT	AVERAGE TIME (DAYS)	H.R.(NUMBER OF PEOPLE)
	<b>Phase 1: Planning</b>			
	<b>Stage 0: Preparation of the improvement</b>			
0.1	Identify opportunities for improvement	-	3	2
0.2	Select a process/product to improve	0.1	2	1
0.3	Process/Product with degrees of freedom/ improvement	0.2	5	2
0.4	Organize a work team	0.3	4	1
	<b>Stage 1: Knowledge of the LCP</b>			
1.1	Model process/product to improve	0.4	15	3
1.2	Evaluate current situation	1.1	2	3
1.3	Evaluate degrees of freedom for improvement ACV	1.2	15	3
	<b>Phase 2: Implementation</b>			
	<b>Stage 2: Redesign of process/product</b>			
2.1	Develop ideas for improvement	1.3	10	3
2.2	Training plan for work team	2.1	5	1
2.3	Establish improvement/implementation plan	2.2	5	1
2.4	Evaluate desired redesign	2.3	5	3
	<b>Stage 3: Implementation of new proc./prod</b>			
3.1	Formation, awareness and training	2.4	15	7
3.2	Execute improvement-implementation plan	3.1	15	7
3.3	Document results	3.2	7	2
3.4	Prepare results report	3.2 Simult.	5	1
	<b>Phase 3: Evaluation</b>			
	<b>Stage 4: Evaluation of new proc./prod.</b>			
4.1	Measure and evaluate obtained results	3.4	5	2
4.2	Evaluate level of compliance (improved?)	3.4 Simult.	4	1
4.3	Document improvement (control system)	4.2	7	2
4.4	Prepare results report	4.2 Simult.	5	1
	<b>Stage 5: Revision and launch</b>			
5.1	Results review by Management	4.4	15	3
5.2	Decision: new process/product?	4.4 Simult.	2	1
5.3	Disseminate improvements in the company	5.2	7	7
5.4	Launch plan - marketing	5.3	3	1
	<b>Phase 4: Improvement management</b>			
	<b>Stage 6: Continuous improvement process</b>			
6.1	Organize continuous improvement groups	5.4	7	1
6.2	Maintain improvement	6.1	15	7
6.3	Establish improvement indicators	6.1 Simult.	5	1
	<b>Stage 7: Monitoring</b>			
7.1	Continuous indicator assessment	6.3	7	2
7.2	Program improvement actions	7.1	7	2
7.3	Start cycle - move to phase 1	7.2	1	1

Source: Elaborated by authors

## 5. RESULTS AND DISCUSSION

### 5.1. Development of project management (Sinnaps).

The Planning Phase aims towards preparing the company for the product development transformation process (Table 6; Figure 7).

Table 6. General scope of the Planning Phase

Stage 0: Preparation for improvement		Stage 1: Knowledge of LCP	
Objectives	<ol style="list-style-type: none"> <li>1. Identify opportunities for improvement.</li> <li>2. Select a process/product to improve.</li> <li>3. Detect areas of improvement.</li> <li>4. Organize a multidisciplinary work team.</li> </ol>	<ol style="list-style-type: none"> <li>1. Have a clear idea of the process to improve.</li> <li>2. Detect areas for environmental improvement.</li> <li>3. Evaluate proc./prod. environmentally.</li> <li>4. Create a proper work environment.</li> </ol>	Objectives
Activities	<ol style="list-style-type: none"> <li>1. SWOT analysis.</li> <li>2. Identify key products/processes.</li> <li>3. Prioritization of key products/processes.</li> <li>4. Present improvement cases.</li> <li>5. Select a team leader.</li> </ol>	<ol style="list-style-type: none"> <li>1. Data collection of the current process (flow chart).</li> <li>2. Evaluation of current practices.</li> <li>3. Results collection.</li> </ol>	Activities
Tools	<ul style="list-style-type: none"> <li>✓ SWOT tools.</li> <li>✓ Seminars – Workshops.</li> <li>✓ Example of similar Ecoproducts.</li> </ul>	<ul style="list-style-type: none"> <li>✓ Visio Tool.</li> <li>✓ Assessment and evaluation questionnaire.</li> <li>✓ Planning tools.</li> </ul>	Tools

Source: Elaborated by authors

Figure 7. Collection of information in the Planning Phase.



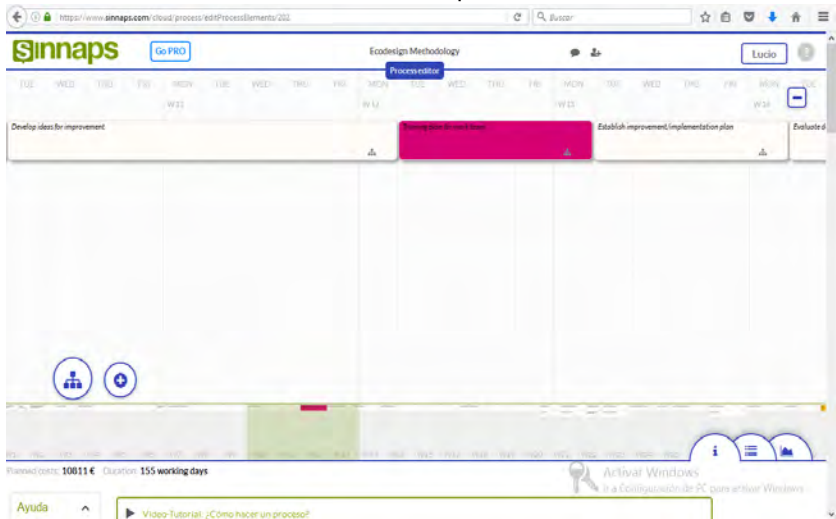
The Implementation Phase aims firstly towards the redesign of a selected project’s PDP, establishing the activities to be developed, the scopes and methods that will be taken into account, etc., executing the plan through a pilot project (Table 7, Figure 8).

Table 7. General scope of the Implementation Phase.

Stage 2: Redesign of the Process/Product		Stage 3: Implementation of the new Process/Product	
Objectives	1. Propose the new process/product.	1. Develop a new model of process/product in practice.	Objectives
Activities	1. Ideas for improvement – new process/product. 2. Adequate training plan for the team. 3. Prepare improvement plan to implement the new process/product. 4. Evaluate the desired (re)design.	1. Execute training plan. 2. Execute improvement plan. 3. Document obtained improvements. 4. Prepare a results report	Activities
Tools	✓ Ecodesign methodology. ✓ Ecodesign strategy wheel. ✓ Regulation of management systems.	✓ The 7 basic tools. ✓ Ecodesign tools. ✓ Seminars – Workshops.	Tools

Source: Elaborated by authors

Figure 8. Collection of information in the Implementation Phase.



The Evaluation Phase aims towards conducting the corresponding evaluation to verify if the expected results are being obtained, once all activities developed on previous phases have been implemented (Table 8, Figure 9).

Table 8. General scope of the Evaluation Phase.

Stage 4: Evaluation of the new Process/Product		Stage 5: Revision and Launch	
<b>Objectives</b>	1. Control and evaluation of the improvement project.	1. Review of results report by the Management. 2. Establish a launch strategy.	<b>Objectives</b>
<b>Activities</b>	1. Measure the objectives and indicators proposed. 2. Evaluate the level of compliance. 3. Establish a control system. 4. Prepare a results report.	1. Results analysis. 2. Authorization of new product. 3. Launch plan – marketing.	<b>Activities</b>
<b>Tools</b>	✓ Evaluation tools – Regulations. ✓ Control formats. ✓ The 7 basic tools.	✓ Cost analysis – benefits. ✓ Communication systems. ✓ Green marketing.	<b>Tools</b>

Source: Elaborated by authors

Figure 9. Collection of information in the Evaluation Phase.



The Improvement Management Phase aims towards establishing improvement indicators for the company which provide a basis for decision making. To acknowledge in writing the improvements achieved, through formats considered adequate for reflecting the developed

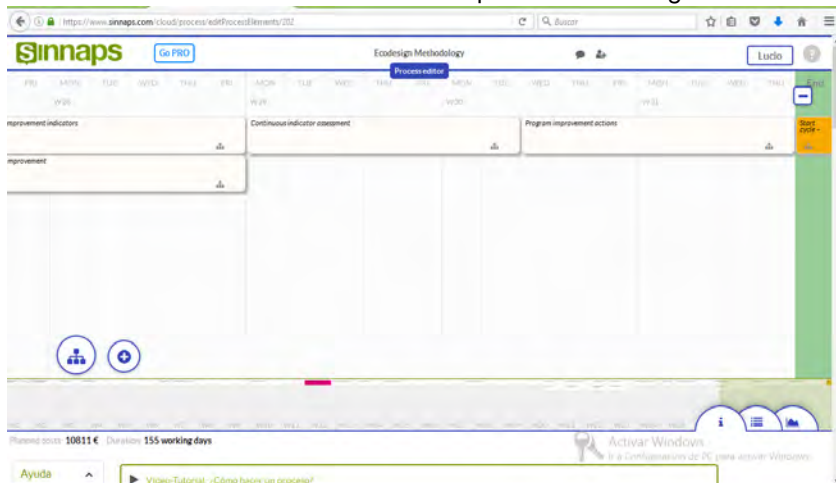
process, thus being able to monitor this improvement and maintaining it (Table 8, Figure 10).

Table 8. General scope of the Improvement Management Phase

Stage 6: Continuous improvement process		Stage 7: Monitoring	
Objectives	1. Deploy improvement to all company areas.	1. Maintain and expand the reach of improvement.	Objectives
Activities	1. Document the obtained improvement. 2. Establish continuous improvement groups. 3. Consolidate change. 4. Reach continuous improvement- a habit.	1. Establish a maintenance cycle. 2. Establish preventive and corrective action plans. 3. Close improvement cycle-move to phase 1: Planning.	Activities
Tools	✓ Methods and techniques of continuous improvement. ✓ Seminars – Workshops. ✓ Models of improvement management and change.	✓ Models of improvement management and change. ✓ Benchmarking. ✓ EQFD.	Tools

Source: Elaborated by authors

Figure 10. Collection of information in the Improvement Management Phase.



## 4.2. Project duration and total cost.

Figure 11. Visualization of the project's duration and total cost.

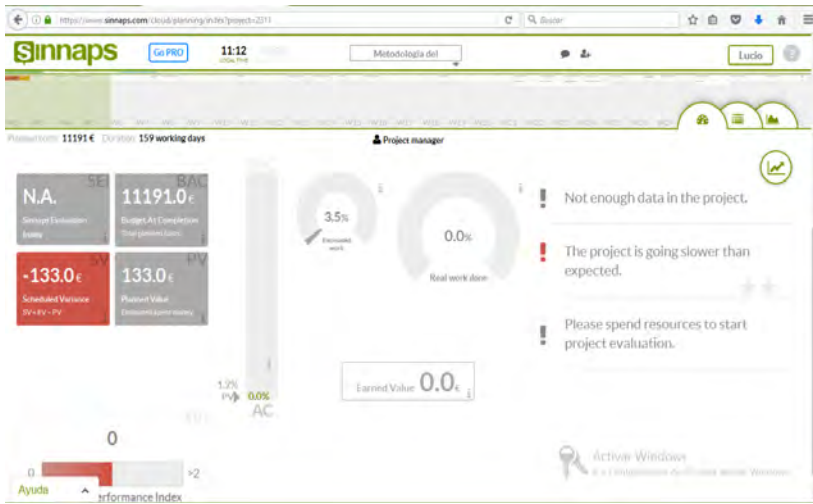


Figure 12. Design of a process template.

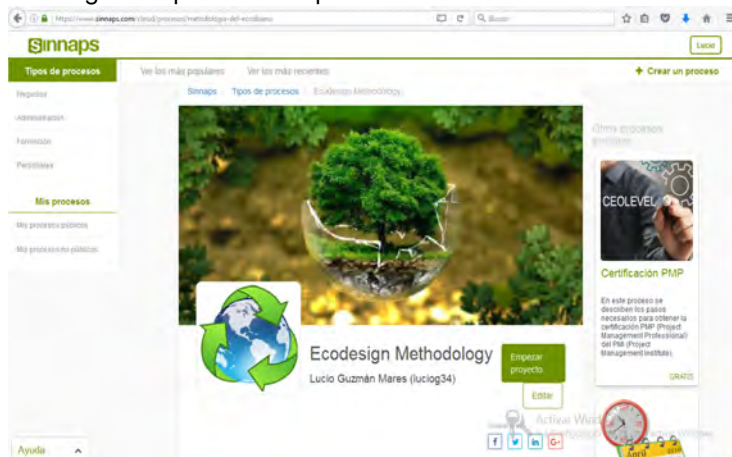
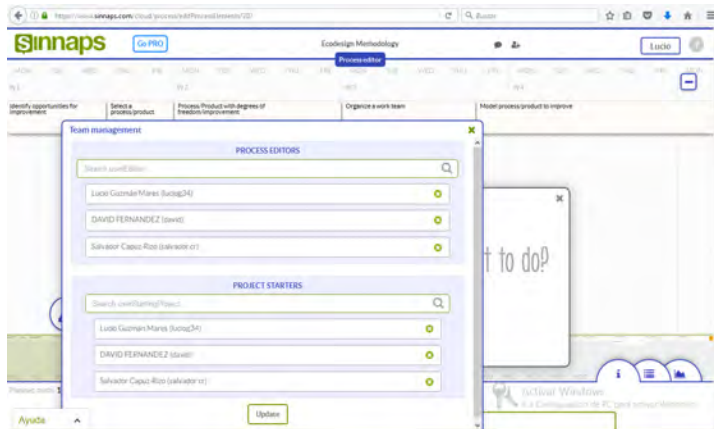


Figure 13. Data in a process template.



## CONCLUSIONS

The tool Sinnaps facilitates the planning of tasks and activities that intervene in the development of a project. In this case, the design and innovation of products and services, which based on an Ecodesign methodology, are presumed to be sustainable.

It is important to have the necessary and detailed project information: temporary relationships, execution times, required work force, people responsible per activity and/or task, among others. The more detailed the information obtained for planning, the more efficient the subsequent project management will be.

Independently on the methodology used, Sinnaps accelerates times towards the identification of the critical path to follow, for the best utilization of resources available in a company. Common adjustments of times and sequences are made in real time; that is, when a category is modified, the project is also automatically modified providing a new critical path.

Project management is a key factor for all companies, and especially when it is properly executed. The availability of user-friendly tools that facilitate such management becomes an important ally for project and senior managers.

A “template” was designed using Sinnaps, so the person responsible for each activity can introduce the information required and the

consequences of their actions on a project can be known immediately after, so, if necessary, adjustments proposed by the program can be made.

In the practical case here exposed, corresponding to the redesign of a furniture element manufactured by a furniture company in Jalisco, the Ecodesign project would require 159 days of work with a cost involved of 11,191 Euros (255,000 Pesos MX approximately).

## REFERENCES

- Alcaide, J., Diego, J. A., & Artacho, M. A. (2001). Diseño de producto. El proceso de diseño. (1), Spain: Universidad Politécnica de Valencia.
- Alston, K., & Roberts, J. (1999). Partners in new product development: SC Johnson and the Alliance for Environmental Innovation. Corporate Environmental Strategy. 6 (2), pp. 110-128.
- Andreasen, M., & Hein, L. (1987). Integrated product development. IFS Publications. Bedford. Berlin: IFS Publications
- Benavides, C. A. (1998). Tecnología, Innovación y Empresa. Madrid: Pirámide.
- Brezet, H., & Van Hemel, C. (1997). Ecodesign: a promising approach to sustainable production and consumption. Paris: UNEP IE.
- Capuz, S., & Gómez, T. (eds). (2004). Ecodiseño, Ingeniería del ciclo de vida para el desarrollo de productos sostenibles. Mexico: Alfaomega.
- Crul, M., & Diehl, J. (1999). Manual para implantar el ecodiseño en Centroamérica/Costa Rica: Cegesti.
- Eder, W. E. (1995). An appropriate structure for design science. Proceedings of the ICED International Conferences on Engineering Design. Prague.
- Fernández, A. J. (2015). La servitización como estrategia para el diseño y desarrollo de Productos más ecoeficientes. 19th International Congress on Project Management and Engineering. Granada.
- Ferrer, P. (2004). Propuesta metodológica para la aplicación del ecodiseño mediante la integración de las consideraciones ambientales en las técnicas de desarrollo de producto, en el marco del diseño sistemático. PhD Thesis. Valencia: Universidad Politécnica de Valencia.
- Getec. (2005). Gestión de la innovación. Grupo de gestión de la tecnología, Madrid: Universidad Politécnica de Madrid.
- Gómez-Senent, E.; Capuz, S. (eds). (1999). El proyecto y su dirección y gestión. Valencia: Universidad Politécnica de Valencia.



- González, H. A. (2006). *La Innovación: un Factor Clave para la Competitividad de las Empresas*. Madrid, España. Madrid: Consejería de Educación de la Comunidad de Madrid.
- Guzmán, L. (2005). *Propuesta Metodológica para la Integración del Factor Ambiental en el Diseño de Productos y de Procesos, a través del Sistema de Gestión, en la Industria del Mueble. Caso de estudio: Sector del Mueble del Estado de Jalisco (México)*. PhD Thesis. Valencia: Universidad Politécnica de Valencia.
- Horward, T. J., Culley, S. J., & Dekoninck, E. (2008). Describing the creative design process by the integration of engineering design and cognitive psychology literature. *Design Studies*, 29(2), 160-180.
- Hubka, V.; Eder, W. E. (1988). *Theory of technical systems*. Berlín: Springer.
- IHOBE. (2000). *Manual Práctico de Ecodiseño. Operativa de implantación en 7 pasos*. España: Gobierno Vasco.
- International Organization for Standardization. (2013), UNE-ISO 21.500. *Directrices para la dirección y gestión de proyectos*. Madrid: AENOR.
- International Organization for Standardization. (2011), UNE-ISO-EN 14006. *Sistemas de Gestión Ambiental. Directrices para la Incorporación del Ecodiseño*. Madrid: AENOR.
- International Project Management Association. (2006). *IPMA Competence Baseline version 3 – Bases para la Competencia en Dirección de Proyectos*. Valencia: AEIPRO.
- Rocha, C., Camocho, D., Bajouco, S., Gonçalves, A., Arroz, M., Baroso, M., ... Somakos, L. (2011). InEDIC Ecodesign Manual Developed within the EU Project InEDIC – Innovation and Ecodesign in the Ceramic Industry 2009/2011. Lisboa: InEDIC.
- Johansson, G. (2002). Success factors for integration of ecodesign in product development –a review of state-of-the-art-. *Environmental Management and Health*, 13 (1) 98-107.
- Maña, F. (2000). *Herramientas y Técnicas de Gestión de la Innovación para la creación de valor, Cataluña*. Barcelona: Instituto Catalán de Tecnología.
- OECD. (1994). *Manual de Frascati, Organisation for Economic Co-operation and Development*. Paris: OECD.
- OECD. (2005). *Manual de Oslo. Guía para la Recolección e Interpretación de datos sobre Innovación*. Madrid: OECD.

- Olsson F. (1985) Produktförnyelse, förnyelseplanläggning, integrerad produktutveckling, LTH: Institutionen för maskinkonstruktion. Lund
- Pahl, G., & Beitz, W. (1996). Engineering Design: a systematic approach. London: Springer.
- Pugh, S. (1991). Total design e integrated methods for successful product engineering. Addison-Wesley.
- Quiroga-Parra, D., Hernández, B., Torrent-Sellens, J., & Felipe-Ramírez, J. (2014). La Innovación de Productos en las Empresas. Caso empresa América Latina. Cuadernos del Cendes, 31(87), 63-85.
- Rieradevall, J., Vinyets, J., & Doménech, X. (2000). Ecodiseño: Los Productos y el Desarrollo Sostenible. Barcelona: Rubes.
- Rocha, C., Camocho, D., Bajouco, S., Gonçalves, A., Arroz, M., Baroso, M., ... Somakos, L. (2011). InEDIC Ecodesign Manual Developed within the EU Project InEDIC – Innovation and Ecodesign in the Ceramic Industry 2009/2011. Lisboa, Portugal: InEDIC.
- Schumpeter, J. (1978). Teoría del desenvolvimiento económico. México,:Fondo de Cultura Económica.
- Ullman, D. (1997). The mechanical design process. New York: McGraw-Hill.
- Van Hemel, C. G. (2002). EcoDesign empirically explored. Design for environment in Dutch small and medium-sized enterprises. Amsterdam. : Boekhandel MilieuBoek.

*Technology Innovation, Finance and CRM:*  
*Repercussions on Competitiveness*  
se terminó de imprimir en junio de 2017

[www.edicionesdelanoche.com](http://www.edicionesdelanoche.com)

# Technology, Innovation, Finance and CRM: Repercussions on Competitiveness

**T**echnology Innovation, Finance and CRM: Repercussions on Competitiveness is an excellent book for experts, students and entrepreneurs. In its pages we can discover different topics about competitiveness factors like CRM, Marketing, Social Network, Innovation and Technology, CSR, and others.

In seven chapters, academics and experts explain the situation of the organization. Every part of this book was based on empiric and real evidence from enterprises, universities, governments and institutions. All of these organizations under study are part of the competitive environment that involves the market. The authors believe in economic progress by means of innovation, entrepreneurship, social responsibility and international cooperation between corporations, regions and countries.



UNIVERSIDAD DE GUADALAJARA  
Centro Universitario de Ciencias  
Económicas y Administrativas



FONDO EDITORIAL  
UNIVERSITARIO

ISBN 978-84-17075-56-9



9 788417 075569