UNIVERSIDAD DE NAVARRA
ESCUELA SUPERIOR DE INGENIEROS INDUSTRIALES
SAN SEBASTIÁN

Continuous Improvement Acceptance Model (CIAM): Towards understanding employee participation

DISSERTATION

Submitted for the Degree of Doctor of Philosophy by

Daniel Andrés Jurburg Melnik

Under the supervision of

Dr. Elisabeth Viles Díez and

Dr. Martín Tanco Rainusso

Donostia-San Sebastián, July 2016

ACKNOWLEDGEMENTS

My first words of gratitude go to my family and friends, who encouraged me to accept this challenge. I want to thank my parents, Howard and Beatriz, who accepted my decision of going abroad, and supported me during all these years. I want to thank my sister and my brother in law, Naty and Salo, who not only supported me, but also gave me one the most joyful moments, which was having my first nephew, Fabián, who is now three and a half years old. I also want to thank my grandparents, uncles and cousins, who all supported me during these years. Finally, I wish to thank my grandparents Carole and León (whom I lost during the course of this thesis), who always encouraged me to do my best and embraced new challenges with enthusiasm. I know they would be very proud that I achieved this moment in my life.

During these four years, many things have happened. From the moment I got to San Sebastian, I knew I was going to be OK. The atmosphere and the people working at Tecnun are the best you can expect. The place is great, and the city is even better. I instantly fell in love with Donosti, the Basque culture and its people, and knew that I was going to spend the best years of my life. None of this could have happened if it wasn't for the amazing people I knew over all these years. This is why I want to thank all these friends and colleagues I have met during my stay in Donosti, both inside and outside of Tecnun. Thank you for letting me be part of your life.

More especially, I want to thank my friends and colleagues at the Industrial Management Department at Tecnun. I want to thank Mentxu, Javi, Sarri, Nico, Josune, María Jesús, Maider, Joseba, Gorka, Susana, Pily, Ángel, Carlos, and Álvaro for all their help and support. I also want to thank Ricardo for his constant help and support during these years. Thank you to all the PhD candidates who joined me during these years, and who most of them are now PhD; thank you Leire, Marta, Ana, Sandra, Claudia, Luis, Dani, Masood,

Darlington, Patricia, Vanessa, Raquel. I hope I did not forget anyone, but if I did, I'm truly sorry and please feel yourself part of this acknowledgement too. I am truly grateful for all your help and advices during the course of my thesis, for all your guiding comments and wise suggestions, all the meals we spent together, and I appreciate all the efforts you made so that I could seize the maximum out of my thesis process and truly spend some of the best years of my life with you.

I would now like to spend a few words thanking Eli Viles and Martín Tanco, who guided me through this challenging process. Since the moment I met Eli, I knew we were going to get along very well. She was always very kind and help me, gradually, to gain confidence in my capabilities until I was able to really lead my thesis process. Thank you for all your time and patience, especially during those moments in which the PhD candidates feel like drifting a little bit in this big ocean that it is the research and academic world. I also like to acknowledge the excellent joint work they did with Martín. It was very easy to work with both of them, even though one was in Spain and the other one was in Uruguay. And about Martín, I can only say thank you. Thank you for all your guidance during these years, since I was still an undergraduate student and we started discussing about the possibility of going abroad to make a PhD. I thank you for trusting in me and giving me the opportunity to come to Tecnun and meet all these wonderful people and have these amazing experiences. Finally, thank you for being my co-supervisor, my boss, my colleague and my friend, all at the same time.

Finally, I wish to thank all the people at the University of Montevideo for their constant support. Thank you Claudio for believing in me, and giving me the support and the opportunity to reach this instance. Thank you Sofi, for being my partner in this long journey and for always being there to give me new energies when I needed. Thank you Adrián for your wise advices and for your always positive energy, and lately, for being also my training companion. Thank you everybody in the CINOI group: Mati A., Diego, Mati E., and all the rest of the people whom I worked with during these years in different projects. Finally, I want to thank all the people at the Engineering Faculty for being like a big family and for creating an amazing working environment.

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ABSTRACT

Continuous improvement (CI) is a very important strategy that companies have at their disposal to achieve business excellence and innovation. Yet CI initiatives fail to a large degree, mostly because of a lack of employee engagement with these initiatives.

Based on a mix of qualitative and quantitative methodologies, this thesis contributes to resolving this problem by presenting a comprehensive relationship model called CIAM (Continuous Improvement Acceptance Model), in order to understand the variables that predict employee participation in CI. The theoretical model is based on an extensive literature review followed by a Delphi study and ISM modelling. An empirical validation of the model, using data from a single manufacturing company, was done using a structural equation modelling (SEM) approach with Partial Least Squares (PLS).

The originality of the model is that it brings together two theories by mixing concepts from typical behavioural models and concepts related to CI enablers. In particular, the model presented here emulates the findings of the technology acceptance model (TAM) by showing that *employee participation in CI* can be predicted by *employee intention to participate in CI*, which in turn can be predicted by two other variables called *ease of participating in the CI system* and *usefulness of participating in the CI system.* The model also presents statistical relationships between all these constructs and the CI enablers gathered from the literature (factors that, according to the existing literature, are essential for the success of CI systems).

The CIAM model could help academics and practitioners to better understand employee participation in CI activities, which would make it possible to design better CI systems in order to achieve long-term sustainability.

CIAM also presents new variables and interactions that help to explain employee participation in CI activities, some of which are barely cited in the CI literature. These new variables and interactions will be worth investigating in greater depth in the future.

The findings from the CIAM model have been used to develop a diagnostic methodology. This methodology has been used in two different cases: in an industrial company and in a public service organization. The results from these two applications show that this methodology can help managers to detect the main strengths and weaknesses of their organization's CI system from the employee perspective (users of the CI system), as well as help them to identify improvement opportunities that will motivate employees to participate more in the CI system.

In summary, this thesis presents an innovative approach to understanding and managing employee participation in CI activities. The positive results obtained from the empirical validation in a particular case and the results derived from the application of the diagnostic tool derived from the CIAM model should serve as a good first step towards future research on employee participation in CI and the improvement of the CIAM model itself.

1 INTRODUCTION

1.1 OVERVIEW

For the last thirty years, many extraordinary advances have been made by both Western and Eastern companies in terms of quality management (Bayo-Moriones et al. 2011). The different quality improvement philosophies point out the importance of sustaining and developing Continuous Improvement (CI) as a strategy for achieving the different competitive advantages needed to have excellent business processes (Flynn et al. 1994; Ebrahimi & Sadeghi 2013).

The benefits of implementing such systems are widely documented in the literature (Singh & Singh 2012). Yet, it is also the case that sustaining the system has been documented as one of the greatest difficulties companies face (Bateman 2005; Kerrin 1999; Bateman & David 2002). In order to achieve this, the need to develop and nurture a specific set of routines in order to attain this CI capability has been made evident (Bessant et al. 2001; Garcia-Sabater et al. 2012).

CI should be regarded as a management philosophy that emphasises the importance of all employees continually seeking out process improvement. It has even been argued that such employee-driven incremental improvement is the source of virtually all economic value, growth, and strategic edge today (Wynder 2008). Also, CI systems could be considered as complex systems in which it is not possible to isolate the techniques and tools used to achieve a set of objectives (productivity increase, quality improvement, health and safety improvement, etc.) from the people participating in the system and using these tools (García-Arca & Prado-Prado 2011). In particular, the literature shows cases in which companies have failed in attempts to imitate techniques proven successful elsewhere due to difficulties in engaging people inside the organization (Jaca et al. 2014b; O'hEocha 2000).

1.2 PROBLEM DESCRIPTION

Despite not being a new subject of study or practice, some authors state that there is still a need for further studies regarding CI, especially in countries such as Spain, with a special focus on small and medium-sized enterprises (Albors & Hervas 2007; Garcia-Sabater et al. 2012). Even in the automotive sector, where CI programs had their origins, CI is still not fully established due to the lack, in many cases, of strategic orientation (García-Lorenzo & Prado 2003). Some recent studies show that companies are still lacking or underperforming in many of the practices cited in the quality and process excellence literature, and they are having problems sustaining their improvement processes (Jaca et al., 2011, Jaca et al., 2012, Garcia et al., 2014).

In particular, in spite of all the benefits of implementing CI systems and the fact that employee participation is considered a key enabler of a CI system's success (Cooney & Sohal 2004; Irani et al. 2004), the problem of how to encourage employees to participate in CI systems is still a significant challenge, according to many researchers and practitioners (Kim et al. 2011; Tang et al. 2010; García-Arca & Prado-Prado 2011; Rapp & Eklund 2007).

Workers, considered as experts in their field of activity with the most intimate knowledge about the day-to-day operations, represent a valuable source for improvement ideas and should therefore be explicitly involved in the improvement and innovation process of the company, although many times they are not (Kannengiesser et al. 2015; Setiawan et al. 2011; Fairbank & Williams 2001). Yet, despite this agreement about the importance and benefits of involving employees into the CI process, sustaining and implementing these processes in practice have been proven difficult (Dawkins & Frass 2005). Some author have argued that empowering employees to participate in innovation and improvement processes requires a set of organizational factors to facilitate and support this employee participation (Kannengiesser et al. 2015). Yet, there is evidence that although managers are well aware of this situation and of the importance of encouraging employees to participate in CI, they fail to do it because they do not know how (Tang et al. 2010).

In consequence, it is important to understand which organizational factors could be triggering employee commitment to CI projects (Lam et al. 2015).

1.3 RESEARCH OBJECTIVES

While the study of the technical aspects of CI are well documented, few studies have examined the role of employee attitudes in contributing to the success of CI initiatives (Lam et al. 2015). Furthermore, there is little academic research specifically focusing on understanding employees' behaviour as they decide whether to participate in CI activities. Most of the studies found in this area are focused on employee reaction towards more or less focused and time-limited change activities, while employee reaction towards continuous and daily improvement is still not fully addressed.

Therefore, knowing which are the main organizational elements motivating employees to participate in CI appears as a very interesting and current problem to tackle, and is therefore, worth researching to complement and advance the CI body of knowledge.

With the objective of deepening the existing knowledge about employee participation in CI, this thesis develops and empirically validates a model called CIAM (Continuous Improvement Acceptance Model), which seeks to understand the main organizational determinants of employee participation in CI activities.

1.4 RESEARCH SCOPE AND LIMITATIONS

The scope of this study includes studying the possible relationship between all organizational aspects (elements that can be managed by the organization) considered to be relevant for affecting employees' participation in CI activities. To accomplish this objective, this model has the original value of merging some of the ideas appearing in the Technology Acceptance Model with some of the most relevant CI enablers—aspects cited as essential in order to successfully implement any given improvement programme—found in the literature. This explicitly leaves out factors related to personality traits or related to the inherent

character of the employees; things that are too rooted in each employee and that are therefore very difficult to deal with by the company. The study of the effect or importance of such aspects can contribute to the understanding of people's behaviour (and therefore complement this study), but their results escape the scope of this study and should be directed towards improving the human resource recruiting strategies and to help maximize the potential of existing employees (with their existing personalities and character).

Another limitation is that this study intends to understand employees' motivational triggers for participating in CI. Therefore, the model presented in this thesis is intended to be used in organizations already developing CI systems or activities. The model could also be used in organizations that had used CI systems, but have abandoned these kind of programs, to try to understand reasons for failure. Yet, it could prove somewhat difficult to apply it directly onto organizations with no previous deployment of CI initiatives. Nevertheless, it could be used as a reference model for new CI adopters to have a better understanding of how to build the CI system in order to maximize people's intention to participate.

Finally, the model presented here is intended to be generic, in the sense that it seeks to explain employee participation in CI regardless of the specific improvement philosophy set in place by the organization. Nevertheless, in this thesis, employee participation in CI has been narrowed to participation in CI projects and formal suggestion systems since they are two of the most typical forms of employee participation systems found in organizations.

Therefore, the results from this thesis could be regarded as a first step towards a more comprehensive understanding of the determinants of employee participation in CI activities and how to improve this participation. In particular, and taking into account the typical time constrains regarding a PhD thesis, the CIAM model presented here which has been validated using data from one particular manufacturing case, should be regarded as a version 1.0. Future research will be needed to keep on improving the understanding of this very complex topic as well as improving the CIAM model.

1.5 RESEARCH STRATEGY

The research strategy supports the whole process of finding answers to the proposed research objectives. Making a good selection of the different methodologies facilitates the process of finding these answers and reaching the intended scope of the research objectives agreed within the research group (Philips & Pugh, 2000).

The scientific paradigm and the nature of the research problem will determine the methodology that should be adopted in each specific case in order to give adequate answers to the different objectives and research questions agreed by the research team. In other words, a clear understanding of the expected results is necessary to justify the methods used by the research team in order to fulfil their research objectives.

Figure 1 presents an outline of the research strategy used during the course of this thesis. First, a literature review was conducted with the main objectives being find information about CI and its main current challenges, define the research problem (find a research gap), and find relevant information needed for the subsequent steps of the research. Second, an exploratory phase based on semi-structured interviews and surveys was conducted in order to better define and find evidence for the research problem addressed in this thesis. Finally, with the objective of improving the understanding of determinants of employee participation in CI, different qualitative and quantitative methodologies were used to develop and present a first empirical validation of the CIAM model. A brief explanation of each of the methodologies used for the realization of this thesis, showing evidence from the literature supporting their use in similar conditions, will be presented in subsequent chapters.

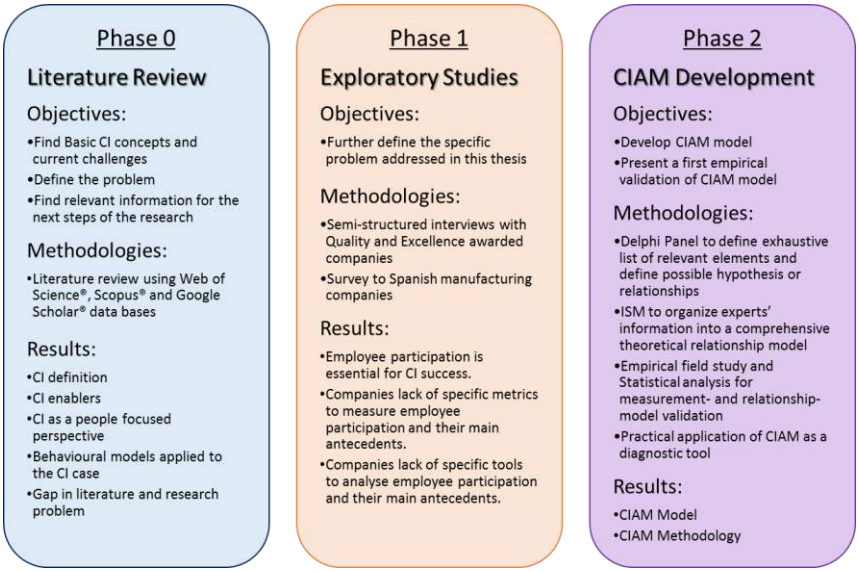

Figure 1 - Research strategy

1.6 THESIS ORGANIZATION

This thesis is divided in nine main chapters, being chapter 1 this introduction. Chapter 2 presents the state of the art about CI and behavioural theories relevant to understand and support the findings from this research. Chapter 3 presents the research questions and hypothesis. It also explains briefly the different research methodologies used to develop the thesis. Chapter 4 describes the methods and main results derived from the preliminary exploratory study conducted to further characterize the problem. Chapter 5 explains the building of CIAM model, while chapter 6 presents the empirical validation of both, the measurement model and the relationship model. Chapter 7 shows the development of a diagnostic tool based on the CIAM model, and the main results derived from its application to two different cases. Finally, chapter 8 concludes the thesis and presents future research lines. Chapter 9 shows the references used and finally, some appendixes are included.

2 STATE OF THE ART

2.1 CONTINUOUS IMPROVEMENT

Given todays' fierce competition and constantly changing markets, one of the main goals of organizations has been to improve competitiveness in terms of product quality and process efficiency, in order to increase their survival possibilities. To accomplish this enduring task, these companies must seek out new methods allowing them to remain competitive and flexible simultaneously, enabling their companies to respond rapidly to new demands (Singh & Singh 2015). These improvements are usually reached by two ways: either by means of the development and incorporation of new technologies and/or equipment (usually referred as radical innovation), or by generally gradual improvements that raise the standards in the company (sometimes referred as incremental innovation) (García-Arca & Prado-Prado 2011). This last option, which requires hardly any investment, is generally called "Kaizen" in Japan and "continuous improvement" in the West (Singh & Singh 2012).

The concept of CI represents the basis for other improvement philosophies or techniques, such as lean manufacturing, total quality management (TQM), Six Sigma and recently Lean Six Sigma, as well as in most employee involvement programmes, customer service initiatives, and waste reduction campaign (Singh & Singh 2015; García-Arca & Prado-Prado 2011).

There is ample documentation of companies' successful implementation of CI (Garcia-Sabater et al. 2012; Jaca et al. 2012; Singh & Singh 2015), and of their effect on the improvement of various indicators, both productive and non-productive (Jung & Wang 2006; Marin-Garcia et al. 2008). Moreover, Garcia-Arca and Prado Prado (2011) have revealed significant relationships between the behaviours of CI and the general performance of the company. In particular,

Table 1 shows a list of most of the benefits reported by companies when implementing CI, adapted from (García et al. 2014; Corso et al. 2007).

Table 1 – Main reasons for implementing CI programs in companies

Main reasons for implementing CI
Less reworks
Increased productivity
Development of a culture that supports long-term improvement
Reduced inventory
Reduced transportation
Improve product and process quality
Reduced costs
Improve worker motivation and decreased absence
Increased employee commitment/attitude towards change
Improve productivity indexes
Fast new product introduction
Improve customer satisfaction
Reduced fail in machinery and tools
Improve delivery reliability
Increased employees skills and competences
Improve safety and working conditions
Promote Teamwork
Support for creating a learning organization
Improve organization, cooperation and communication
Improved supplier relationships

Yet, it should be pointed out that performance improvements are not always achieved right away, but instead, they normally require that a certain time goes by and that a cultural change in the companies is tackled (Paipa-Galeano et al. 2011). In particular, it has been expressed that one of the main difficulties of these kind of systems is actually sustaining CI over the long term, especially after an initial period of two or three years (Jaca et al. 2012). It has also been documented that positive results in terms of generation of new routines and CI system adoption by the organization is not expected to happen until a period of five years has past (Jaca et al. 2010). Therefore, it becomes clear that CI

implementation is not an easy task and requires a constant effort from all the organization. In particular, it has been argued that without the active involvement of everyone in the organization, and the required resources and support from top management, CI in organizations cannot be successful (Bhuiyan & Baghel 2005).

2.2 CI ORIGIN

The beginning of modern improvement systems can be traced back to the 1800s, when several USA companies started to implement management systems based on encouraging and rewarding employees for their improvement ideas (Singh & Singh 2012). As argued by Robinson (1990), one of the first modern CI program is attributed to the National Cash Register in 1894, and has many reminiscent with current CI systems in that it included improving labour-management relationship, encouraging and rewarding improvement suggestions, and developing employees by providing educational opportunities.

By the early 1900s, attention was focused on Taylor's scientific management approach. This method, involved analysing the relationship between the employee and the different industrial production working systems used, in order to maximize the efficiency of the labour force and the machines (Paipa-Galeano et al. 2011). In particular, this early approach towards industrial improvement, involved developing methods to help managers analyse and solve production problems using scientific methods (Singh & Singh 2012). To achieve this, Taylor insisted on breaking down the production process in order to analyse and improve each of the different parts of the process. To do so, he proposed things such as systematic task division, sequential and rational organization of tasks, and controlled timing to achieve piece rates and labour standards (Paipa-Galeano et al. 2011). Another important contribution to productive improvement systems at the beginnings of 1900s was Henry Ford, who revolutionize industry by introducing mass production, and the concept of an assembly line in which the product reaches the workers' stations and not the other way round. It can be said that the contributions of Ford and Taylor lead American industry to its most intense period of growth (Paipa-Galeano et al. 2011).

To enhance industrial development on a national scale during WWII, Americans introduced a program called "training within industry", which intended to make supervisors conscious about the importance and different techniques within CI (Singh & Singh 2012). The oil crisis of 1973 helped to fade away some of the US industrial dominance (which had been on for almost two decades following the WWII), and most CI programmes were suspended in most US industry (Singh & Singh 2015). It also brought many problems related with diversification of markets, making demand more unpredictable. These changes called for a change in Taylor and Ford's ideas about industrial management, finding new ways to adapt to the new market requirements.

Meanwhile, Japan had been destroyed at the end of WWII. This implied that Japanese industry had to be rebuild, almost from scratch. By the late 1940s, US occupation on Japan imported the ideas of improvement programs used in US. For example, they imported the "training within industry" program in an attempt to rebuild Japanese industry as quickly as possible but without the need for huge investment of capital (Schroeder & Robinson 1991). Furthermore, Japanese companies could not apply most of the western concepts about industrial management because of space constraints, lower demands, and scarce resources. This argument partially explains the development of production systems like Just in time (JIT), in which they had to produce under very strict inventory control policies (Hopp & Spearman 2001). It also helps to explain why their improvement programs were aimed at reducing waste around their processes, as a way to boost the sustainable economic growth of Japanese industry (Paipa-Galeano et al. 2011). This rapid success of Japanese companies attracted the attention of western companies, who, by 1980s, were already starting to import Japanese concepts back to US.

Among the most important theories about CI, originated in Japanese post-war industry recovery, we must mention the following: Kaizen and the Toyota Production System.

First, we have Kaizen philosophy, which was developed by Masaaki Imai in the 1980s. It referred to a way of constantly improving the production system, by engaging everyone in the organization (from managers to shop-floor employees).

Kaizen philosophy is based upon three main aspects (Imai 1986). The first one implies thinking about the different processes inside the organization, meaning that every process came from the client's needs, and therefore, one should always look to satisfy these needs in order to stay competitive. The second aspect of Kaizen is related to finding ways to measure the performance of the processes (not only their productivity but also other measures of performance) as the only way to detect improvement areas. Because of this, Kaizen incorporates statistical concepts and tools for problem solving, such as the ones developed by Juran, Deming and Ishikawa among others. In particular, one predominant tool is the PDCA (plan-do-check-act) cycle developed by Deming. Finally, the third important aspect of Kaizen is focusing on people. Imai argues that it is important to create an organizational environment that fosters employee personal growth, something which appears to be related with people's participation in improvement activities. This argument implies that Kaizen is a philosophy that supports and acknowledge employees' efforts towards improving the processes, something that somewhat is opposed to many western managerial practices relying exclusively on analysing performance in terms of results and not effort (Paipa-Galeano et al. 2011).

Second, we have the Toyota production system (TPS). In the early years, Toyota suffered many major problems, including poor quality and high costs, and therefore, it took the improvement actions to eliminate all waste (Yang et al. 2012). The original ideas for the TPS came from Sakichi and Kiichiro Toyoda but were operationalized by Taiichi Ohno at the end of 1940s. TPS is supported by three philosophies: JIT, Jidoka (translated as autonomation), and kaizen (Santos et al., 2006). It also includes looking for constant ways of eliminating wastes around the productive processes. In 1989, Shigeo Shingo gave further scientific fundament to TPS with a focus on improving processes and improving operations. After Womack et al.'s (1990) book entitled 'The Machine That Changed the World', the term "lean production" was coined to describe TPS. Womack and Jones (2003; 1996) took all the learning from the TPS and Kaizen, and developed the idea of a managerial system (lean thinking or lean production) that could help any company to increase its performance by implementing it. This promise of dramatic potential benefits by implementing lean encouraged

many companies around the world to adopt the paradigm of lean production (Yang et al. 2012; Yang & Yang 2013). According to Yang and Yang (2013), the International Motor Vehicle Program, based at MIT, has been an important catalyst for the increasing popularity of TPS around the world, since they have shown, through various publications over the years, the benefits of TPS to improve productivity and quality, and to reduce inventory. A synthesis of TPS or lean production system is appreciated in Figure 2.

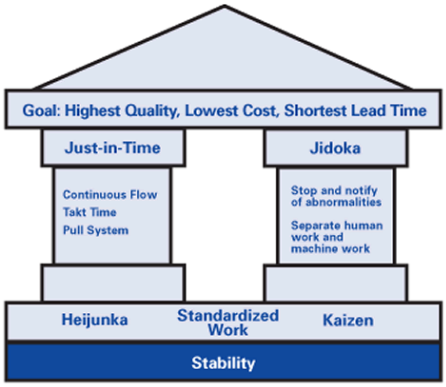

Figure 2 - TPS house – Taken from Lean enterprise institute (www.lean.org)

Although many years have passed since the first implementations of TPS, lean and kaizen, many adopters of these philosophies have had difficulties in successfully implementing the system because its holistic philosophy differs markedly from other more traditional approaches. For example, in the case of lean implementation, manufacturers have tended to place too much emphasis on the hard side (technical) of lean, while paying little attention to the soft side (human related) of the system (Yang & Yang 2013). These authors argue that this is a potentially significant mistake, because these soft factors have played a critical role in the successful implementation of lean in Japanese firms. In fact, the original supporters of CI (Imai, Hirano, Womack and Jones) also argued that achieving employee participation was one of the main pillars of the aforementioned improvement systems (Paipa-Galeano et al. 2011).

2.3 CI DEFINITION

CI is a vague concept, and therefore can be susceptible of different interpretations or definitions (Corso et al. 2007). These differences are usually depending on the scope of the CI process inside the organization, the mission pursued by companies or authors when referring to this concept and the level of detail of the definition formulated. To better understand these slightly different definitions along the years and authors, Table 2 shows some of the most relevant definitions found in articles related to CI studies found in the Web of Science® database.

After looking at the many existing definitions over the years aforementioned, for the purpose of this thesis, we will define CI as follows:

The concept of a continuous improvement (CI) system will be defined as the inter-related group of planned, organized and systematic processes of constant change across the whole organization, focused on engaging everyone within the organization into achieving greater business productivity, quality, safety, ergonomics and competitiveness

Despite some differences in how this term is defined, the following characteristics can be highlighted for CI:

- CI is an ongoing cycle, instead of a series of isolated acts. Therefore, it is a constant activity that must be done repeatedly as long as the company exists.
- All people from the organization should participate in the CI process.
- The CI aim is, precisely, to improve. Therefore, the whole organization should focus its CI system on identifying new areas of improvement.

Table 2 - CI definitions over time

Authors	CI definitions
Deming (1982)	Improve constantly and forever the system of production and service (Principle 5 of transformation)
Imai (1986)	Progressive improvement involving everyone in the company (including both workers and managers)
Bessant et al. (1994)	A company-wide process of focused and continuous incremental innovation
Juergensen (2000) in Bhuiyan & Baghel (2005)	Improvement initiatives that increase successes and reduce failures
Robert et al. (2000)	CI refers to an organizational ethic encouraging employees' initiative for learning to improve performance
Bessant et al. (2001)	A particular bundle of routines which can help an organization improve what it currently does
Dahlgaard et al. (2002)	Small continuous changes for the better
Delbridge & Barton (2002) cited in Eguren et al. (2012)	Strengthening creativity and learning in order to develop an environment for growth
Brunet & New (2003)	Pervasive and continual activities, outside the contributor's explicit contractual roles, to identify and achieve outcomes he believes contribute to the organizational goals
Boer & Gertsen (2003)	The planned, organized and systematic process of ongoing, incremental and company-wide change of existing practices aimed at improving company performance
García-Lorenzo & Prado (2003)	It is associated, in addition to its customer focus, with improvements of a generally incremental or progressive nature; it implies little expenditure; is permanent, that is, it has no end; and, in particular, involves the whole organization
Chang (2005)	The continuous improvement cycle consists of establishing customer requirements, meeting the requirements, measuring success, and continuing to check customers' requirements to find areas in which improvements can be made
Bhuiyan & Baghel (2005)	A culture of sustained improvement targeting the elimination of waste in all systems and processes of an organization. It involves everyone working together to make improvements without necessarily making huge capital investments.

Table 2 (Continues) - CI definitions over time

Bhuiyan et al. (2006)	Culture of sustained improvement aimed at eliminating waste in all organizational systems and processes, and involving all organizational participants
Wu & Chen (2006)	A company-wide focus to improve process performance; a gradual improvement through step by step innovation; organizational activities with the involvement of all people in the company from top managers to workers; and creating a learning and growing environment
Corso et al. (2007)	A set of practices and processes originating an uninterrupted innovative flow, which stimulates the whole organization towards sustainable excellence
Corso et al. (2007)	A set of competitive capabilities that allow organizations to learn, innovate and renew
Institute of Quality Assurance cited in Fryer et al. (2007)	A gradual never-ending change which is focused on increasing the effectiveness and/or efficiency of an organization to fulfill its policy and objectives. It is not limited to quality initiatives. Improvement in business strategy, business results, customer, employee and supplier relationships can be subject to continual improvement. Put simply, it means 'getting better all the time'
Lillrank et al. (2001) cited in Rapp & Eklund (2007)	A purposeful and explicit set of principles, mechanisms, and activities within an organization adopted to generate ongoing, systematic and cumulative improvement in deliverables, operating procedures and systems.
Marin-Garcia et al. (2008) cited in Singh and Singh (2015)	Small incremental changes in productive processes or in working practices that permit an improvement in some indicator of performance
Garcia-Sabater et al. (2012)	A planned, organized, and systematic process of continued and incremental change
Jaca et al. (2012)	CI is a relatively simple principle: all members of the organization contribute to improving performance by continuously implementing small changes to their work processes
Sanchez & Blanco (2014)	The continuous process of improvement in the company done with the participation of all staff
Singh & Singh (2015)	A culture of sustained improvement aimed at eliminating waste in all organizational systems and processes, and involving all organizational participants

2.4 SUSTAINING THE CI SYSTEM

CI can be seen as a learnt and interiorized capacity that is demonstrated through a set of routines, which are sometimes regarded as CI success factors (also regarded as enablers). The evidence found in literature support the idea that CI is a very difficult process to handle as it comprises a delicate and difficult balance between these set of critical factors and a mix of tangible and intangible assets of the company (Garcia-Sabater et al. 2012; Garcia-Sabater & Marin-Garcia 2009). The important feature about these enablers is that, unlike other more tangible assets, these routines are difficult to acquire and copy as they are usually the result of extended learning processes. This makes them highly firm specific and therefore a much stronger source of potential competitive advantage.

2.4.1 ENABLING FACTORS AND ROUTINES

One major contribution to the research into CI sustainability has been the work of Bessant et al. (Bessant et al. 2001; Bessant & Francis 1999), who aim to understand the CI process and how it can be successfully managed through a set of enabling routines. They argued that managing the CI process effectively depended upon seeing CI as the evolution and aggregation of a set of key behavioural routines within the firm. They also argued that the process of acquiring such capabilities implied a long and difficult journey, involving the articulation and learning (usually by practising) of behaviours and reinforcing them until they become routines. In particular, Table 3 show the different CI key routines needed to succeed in the CI process, defined by Bessant et al. (2001).

Table 3 - Key routines associated with CI - Taken from Bessant et al., (2001)

Routines or abilities	Behaviours
'Understanding CI' - the ability to articulate the basic values of CI	· People at all levels demonstrate a shared belief in the value of small steps and that everyone can contribute, by themselves being actively involved in making and recognizing incremental improvements. · When something goes wrong the natural reaction of people at all levels is to look for reasons why etc. rather than to blame individual(s). · People make use of some formal problem-finding and solving cycle
'Getting the CI habit' - the ability to generate sustained involvement in CI	· People use appropriate tools and techniques to support CI · People use measurement to shape the improvement process · People (as individuals and/or groups) initiate and carry through CI activities (they participate in the process) · Closing the loop - ideas are responded to in a clearly defined and timely fashion – either implemented or dealt with
'Focusing CI' - the ability to link CI activities to the strategic goals of the company	· Individuals and groups use the organization's strategic goals and objectives to focus and prioritize improvements everyone understands (i.e. is able to explain) what the company's or department's strategy, goals and objectives are. · Individuals and groups (e.g. departments, CI teams) assess their proposed changes (before embarking on initial investigation and before implementing a solution) against departmental or company objectives to ensure they are consistent with them. · Individuals and groups monitor/measure the results of their improvement activity and the impact it has on strategic or departmental objectives. · CI activities are an integral part of the individual or groups work, not a parallel activity
'Leading the way' - the ability to lead, direct and support the creation and sustaining of CI behaviours	· Managers support the CI process through allocation of time, money, space and other resources · Managers recognize in formal (but not necessarily financial) ways the contribution of employees to CI · Managers lead by example, becoming actively involved in design and implementation of CI · Managers support experiment by not punishing mistakes but by encouraging learning from them
'Aligning CI' - the ability to create consistency between CI values and behaviour and the organizational context (structures, procedures, etc.)	· Ongoing assessment ensures that the organization's structure and infrastructure and the CI system consistently support and reinforce each other · The individual/group responsible for designing the CI system design it to fit within the current structure and infrastructure · Individuals with responsibility for particular company processes/systems hold ongoing reviews to assess whether these processes/systems and the CI system remain compatible · People with responsibility for the CI system ensure that when a major organizational change is planned its potential impact on the CI system is assessed and adjustments are made as necessary.

Table 3– (Continues)

Routines or abilities	Behaviours
'Shared problem-solving' - the ability to move CI activity across organizational boundaries	· People co-operate across internal divisions (e.g. cross-functional groups) in CI as well as working in their own areas · People understand and share an holistic view (process understanding and ownership) · People are oriented towards internal and external customers in their CI activity · Specific CI projects with outside agencies - customers, suppliers, etc. - are taking place · Relevant CI activities involve representatives from different organizational levels
'Continuous improvement of continuous improvement' - the ability to strategically manage	· The CI system is continually monitored and developed; a designated individual or group monitors the CI system and measures the incidence (i.e. frequency and location) of CI the development of CI activity and the results of CI activity. · There is a cyclical planning process whereby (a) the CI system is regularly reviewed and, if necessary, amended (single-loop learning) · There is periodic review of the CI system in relation to the organization as a whole, which may lead to a major regeneration (double-loop learning). · Senior management make available sufficient resources (time, money, personnel) to support the ongoing development of the CI system.
'The learning organization' - generating the ability to enable learning to take place and be captured at all levels	· People learn from their experiences, both positive and negative · Individuals seek out opportunities for learning / personal development (e.g., actively experiment set their own learning objectives). · Individuals and groups at all levels share (make available) their learning from all work experiences · The organization articulates and consolidates (captures and shares) the learning of individuals and groups · Managers accept and, where necessary, act on all the learning that takes place · People and teams ensure that their learning is captured by making use of the mechanisms provided for doing so · Designated individual(s) use organizational mechanisms to deploy the learning that is captured across the organization

More recently, several authors have worked, from a resource and capabilities perspective, on understanding the main elements affecting the success and sustainability of the CI systems. In particular, all these authors have undertaken research regarding the discovery of a series of CI enablers, understood as a list of critical factors which their presence or absence can determine the success or failure of CI initiatives. Table 4 show a summary of the different enablers and inhibitors mentioned by each author.

Other contributions about these elements being responsible for the success or failure of CI systems can be found as follows: top management support and commitment (Sila & Ebrahimpour 2002; de Koning & de Mast 2005; Readman & Bessant 2007; Bateman & Rich 2003), strategic focus on CI through the definition of an appropriate set of goals and objectives (Womack & Jones 2003; Sila & Ebrahimpour 2002; Terziovski 2010), using the right methodology to implement CI throughout the whole organization (Terziovski 2010; Bilalis et al. 2002; Parry & Turner 2006), creating and sustaining a CI culture (Dahlgaard-Park et al. 2013), employee support and commitment (Sun et al. 2009; Bowen & Spear 1999; Prajogo & Sohal 2004), outstanding information, communication and knowledge-transfer systems (Corso et al. 2007; Sila & Ebrahimpour 2002), and having a CI management and follow-up system to track the CI efforts and progresses made (Geralis & Terziovski 2003).

Also, other elements less cited include: effective internal processes, workplace safety, focus on customers, application of methodologies to understand customer's voice, 5s implementation, resistance to change, consistent approach to improvement activities, development of structures to stop the bugs, make operating practices, establishment of long-term goals, and shaping a learning organization and focus on development of critical processes and quality management systems (García et al. 2013).

Table 4 - CI enablers cited in recent literature

Garcia et al 2013 and 2014	Jaca et al 2012	García Sabater et al 2012	Dahlgaard and Dahlgaard-Park 2006
Commitment and motivation of staff	Management commitment and involvement	Management involvement and strategy	Efficient cross functional management
Support from senior management	Key performance indicators, linked to obtained results	Setting objectives and the need for metrics	Leadership for organizational excellence
Allocated resources (time, economic, spaces)	Achievement and implementation of results	Clarification and creation of new structures	Knowledge of specific improvement tools
Leadership	CI objectives linked to strategy	Resources	Company-wide education programs
Developing a CI culture	Use of appropriate methodology	Leadership management	Everybody's participation
Set clear goals for improvement programs	Assignment of specific resources to CI: economic, time, space	Methods for expanding CI	Empowerment and partnerships
Appropriate methodology	Adequate training	Training and abilities	Pro-active and open culture
Standardization and process measurement	Involvement of a task force in the improvement program	Selection of CI projects	Built eternal core values such as trust and respect
Org. of support teams	Communication of CI results	Cultural aspects	Building quality into people
Presence of a CI facilitator	Getting more people involved	Worker involvement	Co-operative culture
Communication	Promote team working		Supporting management
Differences between CI focus and existing culture	Provide a CI facilitator		Satisfy human's spiritual needs
Employee attitude	Selection of the appropriate areas for improvement		Satisfy human's mental needs
Interdepartmental cooperation	Adaptation to the environmental changes		
Follow the PDCA cycle	Recognition or reward to participants		
Training and education			
Heterogeneity of improvement teams			
Skills and experience			
Establish policies, objectives and structure			

Table 4 (Continues) - CI enablers in recent literature

Bateman 2005	Albors and Hervas 2007	García-Arca & Prado-Prado 2011	Eguren et al 2012
Formal CI methodology	Management commitment	Appropriate org. Structure to support implementation	Management commitment
CI alignment	Resources	Management commitment	Company culture
Measure CI	Methodology	Shop staff commitment	Strategy
Management support	Training	Trade union commitment	Leadership and structure
Management involvement	Culture	Multi-skilled work teams with clear functions	Resources
Employee participation	Alignment with company strategy	Participation in the whole CI process by staff	Projects
Communication		Understand corporate culture as adapting to change	Focus on critical processes
Empowerment		Emphasis on the design process prior to implementation	CI method based on PDCA
Incentives		Suitable work methodology with objective and KPIs	Specific training
CI leader or facilitator		Reward and recognition system	Management and follow-up
Specific training		Continuous communication at all levels	
Resources		Specific training and motivation	
		Suitable PM and follow up	
		Priorities in implementation	
		Standardization of procedures	
		Enough resources for a swift response	

In terms of the capabilities or resources needed to support and sustain a CI system, one of the first to be mentioned in the literature is the *organizational support* seen by the employees as the support and commitment of management. Bessant et al. (2001) argued that although the development of CI involves a behavioural learning process which takes place over time, the key variable to have successful CI systems was not to do so much with the length of time implementing it but more to do with the amount of management effort put in to build and sustain the system. Moreover, Readman and Bessant (2007) showed through a survey to UK companies that over 90 percent of respondents found supportive leadership, support of managerial staff and regular shop-floor visits by management to be very important aspects to have successful CI programmes. Also, results from Yeh (2003) suggest that standardized organizational structure is a determinant of employees' participation in practices related to TQM. Finally, Chen and Wu (2004) explained that CI success depends on the promotion of good improvement model and management support.

Another important enabler of CI systems, related to top management support is *CI alignment*, understood as the alignment of all CI objectives and goals throughout the whole company, setting a common direction of the change initiative. For example, Besant et al. (2001) stated the importance of linking the CI activities with the strategic goals of the company as some of the key routines associated with successful CI systems. In addition, Sila and Ebrahimpour (2002) showed that both top management commitment and strategic planning were included in a large number of studies as important factors for the success of improvement programmes such as total quality management.

Going further into the enablers, Aloini et al. (2011) state that CI could be understand as a pattern of learned behaviours that evolve over time, suggesting that another critical factor for CI system success should be allowing for *good communication* and knowledge-transfer systems. In this sense, Singh and Singh (2012) state that employee commitment comes from direct contact and communication between the individual and his boss, therefore reinforcing the idea of having good internal communication. Moreover, Albors and Hervas (2007) showed in a survey made to the Spanish industry sector that one of the

barriers hampering CI implementation was the lack of appropriate information and knowledge sharing.

As far as sustaining the CI system, another enabler mentioned refers to a *good implementation process* being needed. To achieve this, Singh and Singh (2012) suggest that manufacturing companies should build on specific skills and tools designed for attaining long-term core competencies and market leadership. They go further by stating that in order for companies to become more flexible and adapt more quickly to changes, they need to implement a sound CI strategy. Moreover, Bessant et al. (2001) argued that in order to generate sustained involvement of people into CI activities, employees should make use of appropriate tools and techniques.

Related to the implementation methodology, Jiménez-Jiménez and Sanz-Valle (2008) suggest that *training* is important in order to develop the required employees' skills and knowledge needed for participating in the innovation process of the company. Yeh (2003) and Karia and Asaari (2006) also support this idea, by showing that training and education were important factors to determine employees' involvement in CI quality activities, either by showing a positive direct impact on involvement or an indirect effect through other variables such as self-efficacy (self-awareness of skills and abilities). Moreover, based on a literature review Garcia et al. (2014) found that training and education was one of the relevant elements contributing to the successful implementation of CI. In addition, Jaca et al. (2012) argued that managers need to support employees with adequate skills and training in order to sustain CI throughout the organization.

Some authors have argued (in relation with creating a CI culture) the importance of *job satisfaction* as a determinant of employee commitment and performance in all aspects related with the workplace. In particular, Dahlgaard-Park (2012) and Dahlgaard and Dahlgaard-Park (2006) stated that managers should work towards satisfying all employees' needs (biological, psychological and spiritual) in order to have satisfied and committed employees. They argued that the CI culture should be built focusing on how to design a quality strategy, which aimed to satisfy people's mental as well as spiritual needs. In this sense,

these authors found that some of the most important factors affecting employees' quality of work life are personal and professional development, a good physical work environment, meaningful work, good job conditions (salary, security), and recognition and self-respect. Positive relationship between job satisfaction and higher levels of organizational commitment and more productive workforce were also found by de Menezes (2012).

Related to achieving this employees' job satisfaction, many authors have also mentioned the possible positive relationship between process improvements and *incentives* (Bateman & Rich 2003; Bhuiyan & Baghel 2005; Spackman 2009). Furthermore, Jimémenz-Jiménez and Sanz-Valle (2008) suggested that companies should offer incentives in order to motivate employees to develop creative activities.

Finally, according to Tang et al (2010), employee *empowerment* exists when employees feel they can exert some control over their work. These authors stated that employee empowerment has been used as an effective management strategy to make employees more involved into their jobs and participate in the decision-making activities related to quality improvement. Similar findings have been stated by Karia and Asaari (2006). Also, Fryer et al (2007) found based on a literature review that 75 percent of analysed articles within public sector believed employee empowerment to be a critical factor towards CI success.

Given that many of the above list of enablers are similar to each other, we have grouped them into more general enablers as following:

- **Organizational Support**: management and staff commitment, leadership, allocation of resources, and follow-up of the CI process
- **CI alignment**: setting of clear goals and metrics for the CI process, alignment with the company's strategy, establishment of policies, objectives and structure
- **Communication**: interdepartmental communication and cooperation, communication of CI results to the rest of the organization, the presence of adequate information and analysis systems, and enablers related with the learning organization

- **Training**: process improvement and problem solving skills, acquiring knowledge, education to understand the CI culture, abilities
- **Self-efficacy**: self-awareness of employees about having enough capabilities and skills to participate in CI
- **Appropriate CI methodology**: use of appropriate methodologies, the presence of techniques, tools and practices to implement CI, the presence of problem solving techniques, follow the PDCA cycle
- **Recognition and rewards**: recognition and/or rewards (incentives) to participants to create more employee buy-in
- **Empowerment**: giving opportunities for employee participation, enough resources to participate in the CI process (mainly time), promote team working, encourage employee participation
- **Social Influence**: active commitment of all employees, encouraging atmosphere for active participation, active leadership by example
- **Job Satisfaction**: good working atmosphere, shared set of values and cultural aspects promoting active involvement, satisfaction with working conditions, satisfaction with personal and professional growth

2.4.2 MANAGING THE CI SYSTEM

It is suggested that members of an organization infer its essence through the practices, procedures and organizational reward systems implemented, and ultimately by the way the organization manages its activities on a day-to-day basis (Yan & Makinde 2011). It has also been argued that the only way for CI to occur efficiently is for it to be understood as a structured process that guides managers in prioritizing performance objectives and resource allocation (Chang 2006).

It have been already shown that getting everyone in the organization (from top management to line-workers) to participate is a key factor for achieving CI sustainability, but it was also one of the main difficulties. One of the reasons is that attaining this kind of participation from all workers is known to demand great effort and commitment, things that take both time and a cultural change in attitude from all workers (Womack & Jones 2003). Therefore, managers should

aim at establishing adequate training programs aimed at allowing this attitude change through the adoption of the CI habits seen before (Imai 1986; Bessant et al. 2001). In particular, some authors mentioned the necessity of having systematic learning methods in order to create the desired culture (Womack & Jones 2003). Moreover, it is necessary that these routines and habits be constantly re-enforced until they become almost automatic reactions. To achieve this, it is necessary that "the way we do things" be made explicit through symbols, structures and visible procedures throughout the organization (Jaca et al. 2014). Moreover, the introduction of a new CI program inside the company will lead to successful results as long as employees are seen as the main stakeholders (Daily & Huang 2001). Investing in CI therefore means investing in people (Terziovski & Sohal 2000).

Going further, to ensure that CI is a sustainable effort over time, companies need to have specific metrics that identify this progress and sustainability (Garcia-Sabater et al. 2012). The use of metrics allows the CI system's complex behaviour to be translated into a series of 'vital signs' that indicate changes in the system and allows the degree to which the defined objectives have been fulfilled to be estimated. Moreover, depending on the metrics chosen, these signals can also show when and why the system is deviating from the expected behaviour or outcomes (Bullock & Deckro 2006). In general, all organizations adopt a series of metrics to measure performance based on the premise that "what cannot be measured cannot be managed" (Kaplan & Norton 1996). In fact, the strategic evaluation of the organization's systems is a hallmark of so-called 'learning organizations' (Bond 1999). However, the company must be careful about the types of metrics it uses to manage the CI process. Recent studies indicate that traditional performance measures, based almost exclusively on accounting systems, are inappropriate for good management and promoting CI (Wongrassamee et al. 2003; Bititci et al. 1997). These financial measures often promote short-term thinking, getting managers to focus on short-term numbers and preventing them from thinking about long-term projects that would affect the balance sheets, which often contradicts the thinking that is necessary for succeeding in CI (Plenert 1999).

CI enablers depend largely on a number of factors. These factors function as catalysts and determine the behaviour of the organization and thus must be managed properly by finding suitable metrics for each. Furthermore, it has been argued that organizations should implement processes for auditing their CI systems in order to evaluate the evolution of the permanent changes that occur in the organization (Singh & Singh 2012). The main objective for implementing these audit systems is to provide structure and metrics for the CI process, allowing the management team to focus its efforts towards moving the system forward (Singh & Singh 2012). However, according to data collected in the second round of the CINet survey administered in 2004, only 52.4 percent considered measuring the impact of CI activities to be a standard practice within the company (Albors & Hervas 2007).

To sum up, in order to achieve CI sustainability, all organizations should consider CI to be a way of life (Bond 1999). CI is a people-focused system, with the main objective being to continuously improve performance by stressing constant learning and knowledge generation as main keys to business success (Yan & Makinde 2011). Because of this, CI depends greatly on a continuous effort made by managers to engage everyone inside the organization.

2.5 CI AS A PEOPLE-FOCUSED SYSTEM

CI is a system by which companies can seize all the employees' potential in order to get the best possible results in terms of business excellence. Having people willing to participate in the CI system should therefore be an objective sought by managers. In fact, CI philosophy is increasingly disseminating into companies interested in establishing systems to nurture and achieve making the most of the potential that their people possess (García-Lorenzo & Prado 2003). Yet, in spite of culture, employee engagement, and "behaviour re-engineering" becoming hot topics in Operational Excellence in the last few years, programs still struggle with average success or even failure (Bhatnagar & Adams 2015). One reason for this is that many improvement efforts often pay little attention to (or entirely overlook) the impact and potential of the human dimension. In particular, they argued that the work on culture is usually limited to focusing on

adapting old behaviours to enable the technical solution, or worse, it is only included in a change management initiative at the end of the CI process design, in an attempt to get buy-in from the workforce in the last minute. These aspects seem to be aligned with Readman and Bessant (2007) findings in which more than 90 per cent answered that CI was contributing to an increased productivity, while less than 40 percent answered that CI was contributing to an increase employee commitment toward change. Moreover, Bhatnagar and Adams (2015) experience suggest that focusing on the human system (and creating CI culture) could lead to a business impact five to eight times greater than initial operational improvement estimates, while also improvement efforts to be self-sustaining with minimal investment. Prior academic research also support that employee participation is key to successfully implementing quality management initiatives (Baird et al. 2011; de Menezes 2012; Lagrosen & Lagrosen 2005; Lam et al. 2015).

Given these findings, a radical new approach to CI implementation should be incorporated to companies' thinking, and that is making the human dimension the focus of the CI process. In particular, although CI has been typically used to improve quality, flexibility, and performance, it has been argued that the real benefit of CI should be that employees be able to influence and contribute positively to the organization (Rapp & Eklund 2007). Also, as Bhatnagar and Adams (2015) suggest, organizations need to understand that the human dimension of CI is the channel through which technical solutions are created and put in place. Indeed, they argued that putting the human system at the centre of improvement efforts is the future of operational and process excellence. Of course, this statement does not imply that practitioners and academics should now neglect the technical side of CI, but rather understand that it is necessary to co-create an approach that truly integrates the human and technical aspects of the CI process.

CI should be a people-focused system intended to engage everyone into continuously participating in improvement projects and activities (Dabhilkar et al. 2007). Therefore, nowadays any organization wishing to achieve outstanding levels of profitability, quality and productivity needs the support of its most precious asset: the people inside the organization. To achieve this, organizations

should try to reintroduce the operational workers into the "thinking" process, something that requires a deep change of shared beliefs and values in order to make everyone in the organization believe that he or she has the potential to contribute creative ideas (Yen-Tsang et al. 2012). Yet, despite being considered one of the pillars for CI system's success, the problem of how to encourage employees to participate in CI systems is still a significant challenge, according to many researchers and practitioners (Kim et al. 2011; Tang et al. 2010; Dawkins & Frass 2005).

Sustaining the CI process by achieving continuous people participation is a task "more easy to say than to do" as stated by Pun et al. (2001). In fact, a survey done in 2008 by PEX network showed that almost 50 percent of change programs failed because of the human dimension (Bhatnagar & Adams 2015). Furthermore, Suárez-Barraza et al. (2011), Jaca et al. (2010) and Jaca et al. (2011), found that some of the main causes of abandonment of CI programs were organizational resistance to change from employees, lack of commitment and support from senior management, lack of motivation from employees to participate, and resistance from unions, among other reasons.

Taking the aforementioned arguments into consideration, it is of utmost importance that companies learn to establish and maintain adequate systems intended to foster active employee participation in CI (García-Lorenzo & Prado 2003). In accordance with this statement, it is not enough to just depend on some degree of empowerment to ensure full participation and commitment, but a more comprehensive and formal system to encourage, track and reward employee involvement is needed (García-Lorenzo & Prado 2003). These same authors argue that employee participation systems (including suggestion systems, quality circles and improvement teams) constitute some of the most widespread systems addressing this issue. In particular, they conclude that those companies more concerned with increasing employee participation in CI choose to do so by establishing suggestion systems and improvement teams, following an international trend that showed a progressive abandoning of quality circles.

In spite of the extended view that the human factor is essential to achieve CI, many authors argue that most of the articles about CI tackle either more

technical aspects of how to deploy the CI system, or focus on the relationship between CI adoption and performance improvement (Sanchez & Blanco 2014). Yet, a certain lack of research done about the relationship between operations management (in relation with CI) and human resources management (focusing particularly on employee participation) has been acknowledged (García-Arca & Prado-Prado 2011). Furthermore, a good part of the recent literature about CI implementation, in particular related to the implementation of personnel participation systems, identifies the need of a cultural change within the organization, with several critical factors enabling these changes (Rapp & Eklund 2007; Singh & Singh 2015). Yet, how these enablers affect employees in participating in CI activities is still a fuzzy area worth researching (Tang et al. 2010). In particular, there is still a need for more academic research specifically focusing on understanding determinants of employees' behaviour as they decide whether to participate in CI activities (Lam et al. 2015).

On the one hand, there are some examples of studies that tackle change management related employee behaviour (which although regarded as time limited and more radical improvements do share common aspects with employees' reactions towards CI implementations). These are the work of Bingham et al. (2013) on the factors affecting employee intention to participate in organization-sponsored causes, Al-Eisa et al. (2009) on the effect that self-efficacy and supervisor support had on employee intention to transfer work-related knowledge, Jimmieson et al. (2008) on how communication and collaborative decision-making affect employee intention to participate in a building relocation, and Kim et al. (2011)on how the anticipated benefits of change, the quality of the employment relationship, and the degree of formal involvement affected employees' intention to support change-related projects. Although these studies are closely related to the research area studied in this thesis, there is still a gap in the sense that the aforementioned research focused on employee reaction towards more or less focused and time-limited change activities, while employee reaction towards continuous and daily improvement is still not fully addressed.

On the other hand, even fewer papers are especially interesting because of their focus on CI activities. One is the work of Yen-Tsang et al. (2012), who used the Theory of Reasoned Action (TRA) to explain CI capabilities inside an organization. They concluded that the TRA model could be useful for explaining behaviour in an operations context such as CI capability. Moreover, Lam et al. (2015) used SEM-PLS to investigate which influence tactics were most effective in soliciting employee commitment to CI tasks, while also examining how influence tactics affected the supervisor-subordinate relationship and the manager's effectiveness in implementing CI initiatives. In other words, they argued that better workplace relationships contribute to better results, while identifying actions managers can take to strengthen those relationships. Yet, their only focus is on the effect of different managerial tactics, while they do not address the possible impact of the rest of the CI enablers seen so far in this chapter. Another interesting work is the one of Tang et al. (2010), who used the Theory of Planned Behaviour (TPB), TRA and the Technology Acceptance Model (TAM) to explain the effect that a series of variables had on employee intention to participate in CI activities in a company that had implemented Total Quality Management (TQM). It is interesting to note that TPB, TRA and TAM are well-established models used to explain people's behavioural intentions towards doing certain activities in many different fields over the last 30 years, but they still are not widely used in the specific field of CI. One of Tang et al.'s (2010) conclusions concerns identifying some of the factors that are likely to encourage employees to participate in TQM activities. Yet, there is still a need for more research in this area in order to generate a more comprehensive model. In particular, they did not test the possible impact of most of the enablers seen in this chapter.

2.6 BEHAVIOURAL MODELS USED IN CI CONTEXTS

Given that most of the aforementioned examples of previous academic research seek to understand organizations' and/or employees' behaviour in CI by means of using TRA, TPB and TAM models to explain their behaviours, a brief outline of these behavioural models will be developed next. Whenever possible, a link between the principles within these models and their possible connection with CI literature will be explained.

2.6.1 INTRODUCTION TO TRA AND TPB

The strategic importance of CI, in conjunction with the need for more research (from a behavioural theoretical perspective) about the impact of the human dimension on the performance and behaviour of different organizational systems, made some authors like Yen-Tsang et al. (2012) use TRA model to explain behaviours in organizational settings. These authors used TRA to investigate the antecedents and behavioural aspects required to ensure CI capability based on operational routines. The use of this kind of behavioural theories to understand the CI process is further explained in the fact that existing research often tends to link employee participation with CI system sustainability. Yet, authors like Bessant et al. (2001) and Bessant and Francis (1999) have revealed that this issue is complex and is determined by contextual and behavioural factors (as shown in previous section of this chapter).

Initially, Fishbein and Ajzen (1975) proposed a framework to explain behaviour and its antecedents based on beliefs, attitudes and intentions which is called the TRA model and postulates the existence of mechanisms that underlie individual behavioural changes. TRA model is one of the most relevant behavioural intention models used by researchers in many scientific fields such as Health, Communication, Marketing and Psychology in a wide range of different contexts and countries, and as a result, different studies have advocated good cross- cultural generalizations (Yen-Tsang et al. 2012).

TRA assumes that individuals are usually quite rational and make systematic use of available information in order to develop a behavioural intention to do something. TRA suggests that people's behaviours could be determined by considering their prior intentions along with certain beliefs that each person would have for the given behaviour.

TRA argues that any given behaviour can be partially predicted by the intention to perform it. According to this model, skills, environmental constraints and intention to perform a behaviour, are antecedents of behaviour. Generally defined, intention refers to a state of mind that directs an individual's attention, experience and behaviour toward a certain object (Al-Eisa et al. 2009). In TRA, intention is a value of three determinants – the person's attitude toward performing the behaviour, the person's perception of the social pressure exerted on him or her to perform the behaviour, and the person's belief in his or her ability to perform the behaviour (Yen-Tsang et al. 2012). The TRA model is based on the assumption that a person behaves, pro-actively depending on his willingness and intention, thus by analogy, we believe that employee' behaviour towards CI activities should initially be based on the intention to participate in these improvements.

Attitudes are recognized as an individual's positive or negative evaluation of a relevant behaviour, and are expressed in terms of the perceived outcomes of performing the behaviour. Subjective norms (social pressure) refer to an individual's perception of whether significant others support or discourage his or her performing of a given behaviour (Bingham et al. 2013). For an employee participating in CI, significant others or influential referents within the work environment could include all those who could provide social support for CI activities such as co-workers, immediate supervisor and managers.

Yen-Tsang et al. (2012) showed that this link between intentions and performing the behaviour is perfectly logical in the context of CI. They argued that CI capability should first be defined as a set of routines, and then since these routines and processes are the way people do things in a company, they can be assumed to be a kind of operational behaviour which reflects human beliefs, values and attitudes, such as the TRA model defines. Based on these arguments,

CI routines are preceded by CI behaviour, which is in turn are predicted by the intention to perform it (a description of the theoretical model for CI capability under the TRA model is shown in Figure 3).

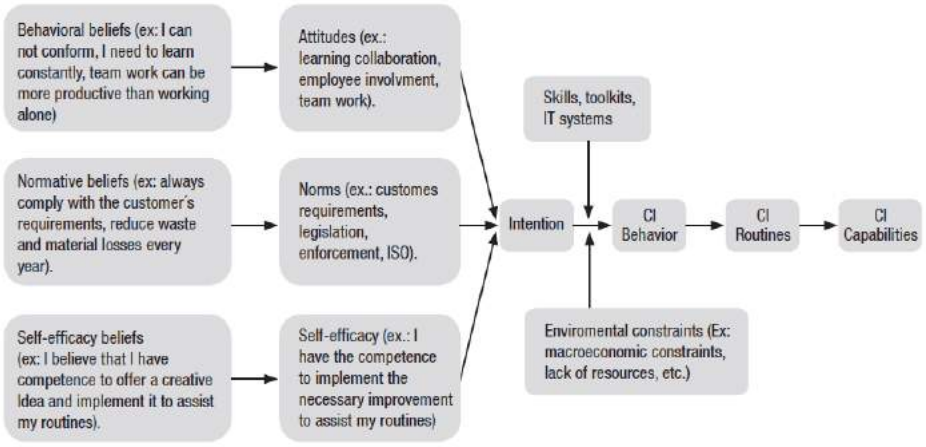

Figure 3 - CI capability model using TRA theory – Taken from Yen-Tsang et al. (2012)

Meanwhile, TPB comes as an extension of the TRA, also proposing that people's individual performance of a certain behaviour is determined by their intent to perform that behaviour. The intent is predicted by attitudes toward the behaviour, subjective norms about performing that behaviour, and perceptions about whether the individual will be able to successfully engage in the target behaviour or not (Marangunić & Granić 2015).

As an extension of the TRA, TPB is based on the presumption that a given behaviour can be predicted by intention (Ajzen 1991). In TPB, intention is viewed as a cognitive representation of an individual's willingness to perform a target behaviour and is assumed as an immediate antecedent of behaviour. In this thesis, for example, the target behaviour could be viewed as employee participation in certain CI activities inside the organization. Therefore, intention to participate thus must be formed in order for actual employee participation to occur.

According to TPB, the formation of intention is presumed to be the function of three antecedents: attitudes, subjective norms and perceived behavioural

control. As a general rule proposed in TPB (Figure 4) to predict behaviour, the more favourable the attitudes toward performing a behaviour, the greater the perceived social approval, and the greater the perceived control, the stronger the intention will be and hence the greater the likelihood of performing the behaviour in question (Al-Eisa et al. 2009).

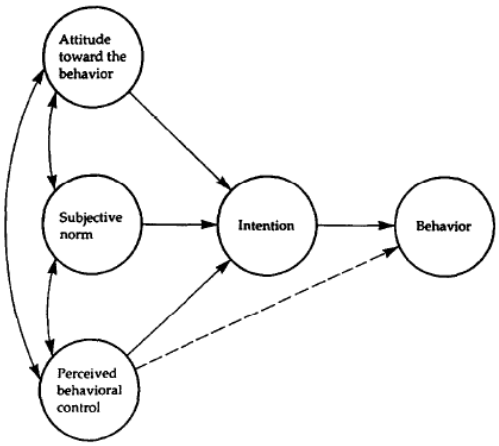

Figure 4 - TPB model representation. Taken from (Ajzen 1991)

Perceived behavioural control describes an individual's evaluation of the difficulty or ease associated with performing the target behaviour. The theory of planned behaviour posits that behavioural control is an outcome of control beliefs, or, more specifically, beliefs about the "presence of factors that may facilitate or impede performance of a behaviour" (Ajzen 2011). Behavioural control varies based on individuals' "salient beliefs concerning adequate resources and opportunities" (Bingham et al. 2013). It was introduced in TPB to deal with situations in which individuals may lack complete volitional control over the behaviour in question. As related to CI participation, perceived behavioural control could reflect the employee's confidence that he or she will have real opportunities of participating in CI.

2.6.2 INTRODUCTION TO TAM

TAM, first introduced by Davis (1989), has its origins in the TRA and TPB psychological behavioural models.

Since its beginnings, TAM has evolved to become a key model in understanding predictors of human behaviour toward potential acceptance or rejection of the technology. The rationale behind the creation of this model was the necessity for comprehending reasons why different users tend to accept or reject technology in everyday situations. Based on the ideas presented in the TRA and TPB, Davis first suggested that the usage of the system could be explained or predicted by the user's motivation, which, in turn, could be predicted by external stimulus consisting of the system's features and capabilities (Marangunić & Granić 2015).

The model was further refined to propose the TAM, which suggested that the user's motivation could be explained by two distinct beliefs and one attitude: perceived ease of use, perceived usefulness, and attitude toward using a specific technology. Perceived usefulness was understood as the degree to which the person believes that using the particular technology would enhance his/her job performance, while the perceived ease of use was defined as the degree to which the person believes that using the particular technology would be free of effort (Venkatesh 2000). Afterwards, the attitude variable was removed and so a parsimonious TAM model was proposed (Figure 5).

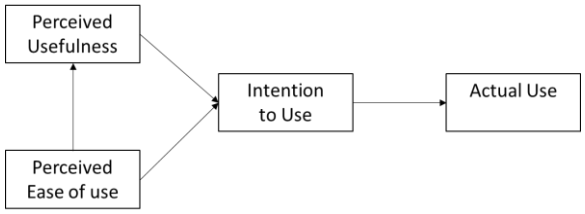

Figure 5 - Parsimonious TAM model. Adapted from (Venkatesh 2000)

After the first model was proposed, TAM model has been revised and modified, in order to better explain the predictors of the TAM core elements. Two of the of the most important extensions are the ones presented by

Venkatesh and Davis (2000) who identified general determinants of perceived usefulness creating what they called TAM2, and Venkatesh (2000) who identified general determinants of perceived ease of use. These two extensions were developed separately, and were combined afterwards by Venkatesh and Bala (2008) to create what they called TAM3 (Figure 6). Some of these determinants were extracted directly from TRA and TPB models (such as self-efficacy and subjective norm), while others were contextual and environmental variables related to specific use of technology, mainly software. Finally, a more general interpretation (Figure 7) has been presented in the unified theory of acceptance and use of technology (UTAUT), in which the main determinants of behavioural intention are: performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh et al., 2003).

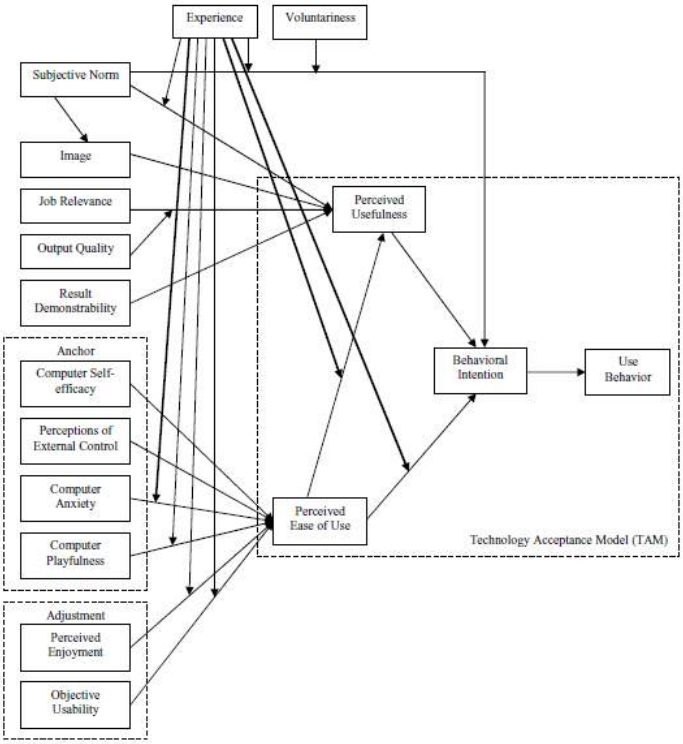

Figure 6 - Extended TAM3 model. Taken from Venkatesh & Bala (2008)

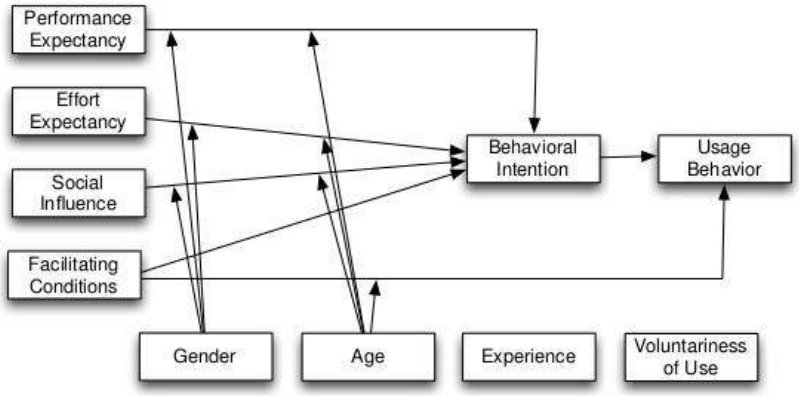

Figure 7 - UTAUT model. Taken from Venkatesh et al. (2003)

As stated previously, one work that demonstrated the valid application of TRA, TPB and TAM models for the case of CI was the work done by Tang et al. (2010). They used behaviour theory to investigate the individual-level determinants of employee involvement in a company developing TQM practices. Despite not being exactly the same, CI is in the core of TQM. Actually, many definitions of TQM could not be identified from many definitions of CI (especially the ones that acknowledge CI as a company-wide focus set of practices to increase business quality and performance). Therefore, the arguments used by these authors for the case of TQM fit perfectly with our definition of CI implementation. To make this issue more clear, Tang et al. (2010) expresses that TQM seeks CI in quality of all processes, people, products and services within an organization. Moreover, they argued that given the characteristics of TQM, one main part of employees' involvement in TQM is employee participation in CI activities related to work quality. They define this employee participation as continuously identifying, analysing, proposing and implementing solutions to problems interfering with their work quality.

They depart from existing research about employee participation and TQM factors at organizational level, and then focus on identifying individual-level determinants of employee participation in CI using a cognitive psychology perspective and structural equation modelling to test their model. They

particularly test the relationship between the following variables: perceived usefulness, perceived risks, subjective norm, professional ethics, perceived behavioural control, attitude towards involvement, intention to involve and employee involvement in CI activities related to work quality (Figure 8). All these associations are based on TRA, TPB and TAM model. They argued that these three behavioural theories allow for integration and for the incorporation of other variables, as long as they make a significant contribution to the explanation of the behaviour.

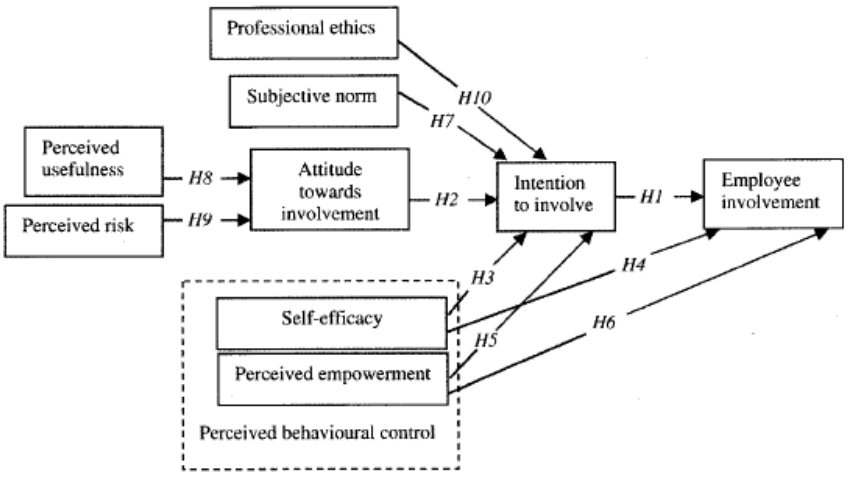

Figure 8 - Behavioural model for understanding employee participation in CI for work quality. Taken form Tang et al. (2010)

2.7 MAIN CONCLUSIONS FROM THIS CHAPTER

To remain competitive nowadays, companies must seek new ways to improve their product quality and process efficiency, increasing their survival possibilities. One way of achieving this is by implementing a system of gradual improvements that raise the standards in the company, usually regarded as CI.

CI origins can be traced back to the 1800s, although most recent forms of CI systems were popularized at the end of 1980s. In essence, these improvement philosophies grounded their success in the participation of all employees and in the careful analysis of processes in order to eliminate waste. More recently, the concept of CI appears at the very basis of most of the current improvement philosophies or techniques, such as lean, TQM, Six Sigma and Lean Six Sigma.

Throughout literature, there is ample documentation of companies' successful implementation of CI, as well as their benefits for the company. Some of the main benefits reported include: less reworks and better product quality, reduced inventory, increased productivity, reduced costs, improvement of working conditions, reduced failure in machinery, increased employee commitment, better communication and cooperation.

Because the term CI can be used both to refer to the results of the process as well as to refer to the process itself, it has been a vague concept susceptible to many interpretations. In this thesis, and after examining the many existing definitions over the years CI is defined as "*the inter-related group of planned, organized and systematic processes of constant change across the whole organization, focused on engaging everyone inside the organization into achieving greater business productivity, quality, safety, ergonomics and competitiveness*". Despite some differences in definition, three characteristics remain common: CI is an ongoing and constant cycle, all employees should participate in the CI process, and CI should be considered an enterprise-wide approach to identify improvement areas.

Despite the many benefits cited, one of the main difficulties of CI systems is actually sustaining the process over long periods, especially after an initial period. Therefore, CI implementation must not be regarded as an easy task and requires a constant effort from all the organization.

Hence, many authors have dedicated to study the issue of sustainability. One major contribution to the research into CI sustainability has been the work of Bessant et al. (Bessant & Francis 1999; Bessant et al. 2001; Bessant et al. 1994), who focused on showing that the CI process and could be successfully managed through a set of enabling routines and behaviours. Furthermore, several authors have worked, from a resource and capabilities perspective, on discovering a series of CI enablers, understood as a list of critical factors which their presence or absence can determine the success or failure of CI initiatives. In general, most authors mentioned enablers related to: Organizational support, CI alignment, Communication, Training, Self-efficacy, CI methodology, Incentives or rewards, Empowerment, Social influence and Job satisfaction. Given that CI successful programs depend largely on a number of enablers, which function as catalysts and determine the behaviour of the entire organization, they must also be managed properly by finding suitable metrics for each of them. Yet, some evidence in literature show that measuring the CI system itself is not a current practice among most of the companies.

Delving further into the issue of CI sustainability, many authors highlighted the fact that without the active involvement of everyone in the organization, CI in any organization cannot be successful. In fact, having people willing to participate in the CI system should be an objective sought by managers in itself. Yet, in spite of culture, employee engagement, and "behaviour re-engineering" becoming hot topics in Operational Excellence circles, many improvement efforts still fail, mainly because of neglecting the impact and potential of the human dimension. In particular, they argued that the work on culture is usually limited to focusing on adapting old behaviours to get buy-in from the workforce in the last minute.

Given these findings, organizations need to understand that the human dimension of CI should be one of the focuses of CI system, since it is the channel through which technical solutions are created and put in place. To achieve this, organizations should learn to establish and maintain adequate systems intended to foster active employee participation in CI. Yet, the problem of how to encourage employees to participate in CI systems remains a significant

challenge. In fact, there are many articles about technical aspects of how to deploy the CI system, or focus on the relationship between CI adoption and performance improvement, but more research is needed about the relationship between operations management and human resources management. In particular, many articles identified the need of a cultural change within the organization, with several critical factors enabling these changes, but how these enablers affect employees in participating in CI is still a fuzzy area worth researching.

In particular, some articles have succeeded in showing the relationship between some of the enabling factors and CI behaviour (including employee participation). Some of them have used well-established behavioural theories such as TRA, TPB and TAM to support their findings, showing the possibility of applying these kind of theories to the CI context. Nevertheless, these same authors argue that there is still a need for more academic research specifically focusing on understanding determinants of employees' behaviour as they decide whether to participate in CI.

3 RESEARCH OBJECTIVES, APPROACH AND STRATEGIES

3.1 RESEARCH OBJECTIVES

From a wide perspective, the problem motivating this thesis involves the complex topic of ensuring the sustainability of improvement methodologies in a business environment. Given the amplitude of the topic and the diversity of possible scopes adopted to give answers to this problem, this research started with an exploratory phase intended to define the specific problem we wished to tackle.

Exploratory studies are used when the objective is to shed light on a phenomenon that is still unclear in the literature. This kind of study aids, as an initial step, in the development of more detailed hypotheses and research questions that will be analysed with more detail in a subsequent phase of the research (Kerlinger and Lee, 2000; Zikmund et al., 2000; Patton, 2002).

This exploratory phase included the use of surveys and semi-structured interviews to identify some of the main current challenges Spanish companies were still facing in their path to achieve successful CI systems. A brief explanation of the methods used will be presented later on in this chapter. It is important to mention that semi-structured interviews and web-based surveys are two different kind of the same generic research method: surveys.

Based on the results from the literature review phase and the aforementioned exploratory phase, we proposed the following statement:

> Employee participation is essential for the success of CI systems. Yet, the reasons why employees choose to participate are still not clear and more research on this topic is needed. Moreover, companies lack of specific metrics and tools to measure and analyse employee participation and their main antecedents.

To address this statement, we conducted a second phase of the research, which includes a model-building step followed by an empirical validation, and a reflection on how to use this model from a practitioner's point of view.

Therefore, the main objective for this second part of the research was to develop and empirically validate a model called CIAM (continuous improvement acceptance model), which seeks to understand the reasons why employees choose to participate in CI activities.

This second phase was guided by the following research questions:

Q1. What are the main elements motivating employees to participate in the different CI activities proposed by companies?

Q2. Is it possible to put them all together into a comprehensive theoretical relationship model?

3.2 RESEARCH APPROACH

Before starting any new research, researchers must adopt a certain way to explain the specific reality, which involves defining a research paradigm (Mackenzie & Knipe 2006). A paradigm could be understood as a set of ideas, beliefs, and arguments that help people to build a context through which to explain reality (Dixon & Martínez 2014). These paradigms or worldviews usually depend on the discipline orientations, the students' advisors/mentors inclinations, and past research experiences (Creswell 2003). The types of beliefs held by individual researchers based on these factors will often lead to embracing different research approaches (Creswell 2003).

The usefulness of adopting a certain research paradigm is mainly related with:

- Guiding the way in which the explanation of a research problem is addressed
- Determining the appropriate methods to get valid answers to the research questions

- Establishing the relationship between the researcher and the subject of research
- Setting the key aspects necessary to interpret and analyse the results of the investigation
- Guiding the way the results are presented in order to be published

A research approach involves the intersection of these paradigms with the research design and the specific methods selected. Each research model has its own characteristics, areas of application, advantages and disadvantages. There is no single approach that constitutes the absolute solution to a given research problem, but each represent different ways to approach an investigation. There are mainly two set of research approaches based on certain research paradigms: the quantitative approach and the qualitative approach (Errasti & Jaca 2014). Typically, depending on the research field, one approach is regarded as more suitable (or more established) by the scientific community. Nevertheless, in fields, such as the one in which this thesis is embedded (operations management and industrial organization), they are rather seen as complementary. For such cases, the choice of paradigm and approach relies on the intentions of the research team and it depends on the scope and specific research objectives. In addition, because of working with complex systems involving a mix of tangible and intangible aspects (in which sometimes the border between topics is not clear), a mix approach, involving both qualitative and quantitative research methods is preferred.

3.2.1 QUANTITATIVE APPROACH

This approach is mainly based on the positivist paradigm, and has been imposed as the scientific method recommended for research conducted within the natural sciences, and later used in other fields. Its nature aims to ensure the accuracy and rigor required by science, philosophically rooted in positivism.

Some of the main characteristics of this approach are (Errasti & Jaca 2014, Dixon & Martínez 2014):

- It pays more attention to the similarities between cases rather than differences

- It searches for models designed to explain, predict and control different phenomena
- It assumes a given and rather static reality, which can be fragmented into smaller units of study (meaning that a restricted view of reality is considered)
- It relies upon objective and measurable variables, while neglects the use of subjective elements in scientific research.
- The researcher must be independent from the unit of study
- The values of the researcher should not interfere with the research problem
- It adopts a deductive-hypothetical model, using quantitative and statistical methods, mathematical analysis and experimental control. All social aspects are categorized into variables and statistical relationships are established.
- The subject of research is not studied one by one in order to detect peculiarities, but instead a representative sample is used in order to generalize the results to other populations.
- It emphasizes in the scientific verification of the data and the search for efficiency.
- The object of study adapts to the research method used

In summary, the quantitative approach highlights elements such as variables (quantitative and qualitative), reliability (consistency and stability), validity (free of distortion), hypothesis (formulation to be tested by checking the facts) and statistical significance (level of acceptance or rejection and accepted margin of error).

3.2.2 QUALITATIVE APPROACH

This approach (based on the phenomenological or interpretivist paradigm) emerges as an alternative to the positivist paradigm, based on the acknowledgement of the existence of more complex issues that cannot be fully explained or understood from the quantitative perspective (Errasti & Jaca 2014). Such is the case of most cultural issues, which, because of their complexity and interrelationship of many explicit and implicit elements, cannot be simply addressed as a sum of different quantitative analysis on restricted aspects of reality, but instead require more holistic approaches provided by qualitative analysis.

Moreover, the qualitative approach has a humanistic understanding of the social reality. Opposed to the quantitative paradigm, reality is never static nor is a reality that is given to us, but instead it is global, holistic and multifaceted. The qualitative paradigm does not conceive the world as something external, objective and independent of humans. On the contrary, it acknowledges the existence of multiple realities. In this approach, individuals are conceptualized as active agents of change, responsible for the construction of the realities they encounter, instead of responding in an automatic manner according to some general law. The qualitative paradigm also includes an assumption about the importance of understanding each situation from the participants' perspectives (Creswell 2003).

Some of the main characteristics of this approach are (Errasti & Jaca 2014, Dixon & Martínez 2014):

- The theory is developed from a perspective form 'inside the problem', since reality is constituted not only by external and observable facts, but also by aspects developed by the subject of study through the interaction with others and the environment
- The object is the construction of practical theories, configured from the praxis and constituted by rules and not by laws
- It stresses the importance of the phenomenon itself

- Tries to understand a certain reality within a given context, therefore, it cannot be fragmented or divided into dependent and independent variables
- It advocates for the adoption of strategies that are specific and unique of human action. (Such as Participatory observation, case studies, action research)
- It relies on a profound study of a particular situation, delving into the different reasons motiving the resulting outcomes
- It does not seek explanation or causality, but rather a deep understanding of the phenomenon

In summary, qualitative research emphasizes meaning (interpretation made by the researcher about the reality), context (aspects that are part of and partially explain the phenomena under study), holistic perspective (without fragmenting it into smaller units of analysis), and culture (values and beliefs used by the researcher while conducting the study).

3.2.3 USING BOTH METHODS: A COMPLEMENTARY VIEW

Recently, a new tendency (based on a more pragmatic paradigm) was born interested in seeking the compatibilities and complementarity between these two approaches (Mackenzie & Knipe 2006, Creswell 2003). This is especially interesting in research projects associated with social issues since some quantitative methods tended to distort or oversimplify complex social realities, while other purely qualitative methods could lack the necessary tools to make useful generalizations or explanations of reality. For example, research using large samples of data and where measurable and mathematically interpretable results can be expected, the quantitative method seems more suitable. On the other hand, when the main objective is to understand the behaviour of a group of people involved in a certain process, and we want to capture the entire process and interactions between the people involved and their environment, a qualitative method seem more suitable.

Based on the aforementioned arguments, for the case of this thesis, in which the reasons or determinants of human behaviour under certain circumstances are being the subject of study, but the idea is also to be able to create some sort of instrument capable of measuring these behaviours, a mix of both methods is required.

In particular, the use of multiple approaches to give answers to the same research question, regarded as triangulation or cross-validation, is considered an advantage (Mackenzie & Knipe 2006). The convergence of the findings obtained through methods from both approaches increases the validity of the results and that these are not the product of mere methodological aspects. Moreover, there is nothing except perhaps tradition, which prevents the researcher from mixing and accommodating the attributes of the two paradigms to achieve the combination that is best suited given the research problem and the available means (Mackenzie & Knipe 2006).

3.3 RESEARCH STRATEGY

In order to give answers to all these questions, and taking in consideration the aforementioned arguments for designing a methodology based both in qualitative and quantitative methods, we propose the following research strategies:

M1. Semi-structured interviews conducted at excellence awarded companies to identify main challenges with the sustainability of CI systems

M2. Web-based survey to assess Spanish companies maturity and current challenges in terms of the implementation of CI systems

M3. Delphi technique applied to a panel of Spanish experts in CI methodologies. The objective was to refine the list of main elements affecting employee participation in CI gathered from the literature, and develop an agreed questionnaire.

M4. Interpretive structural model (ISM) to construct a theoretical relationship model, explaining the main determinants of employee participation in CI activities.

M5. Empirical validation of the theoretical model with Structural Equation Modelling (SEM) using Partial Least Square (PLS) approach. This was used to test the model's hypothesis using real data from employees.

Based on the aforementioned characteristics of quantitative and qualitative methods, this thesis addresses the issue of employee participation in CI from both perspectives. To start with, the survey and semi-structured interviews form part of the exploratory phase of the thesis. While the semi-structured interview represents a mainly qualitative approach to gain real insight into what was happening inside companies committed with excellence and quality improvement, the survey focused on a more quantitative analysis of how different companies were implementing CI. Furthermore, when developing the CIAM model, different qualitative and quantitative approaches were also used. First, the Delphi study, mostly a qualitative method, was conducted in order to get the most out of a group of experts about which where the main elements that should be included in the model. By using a qualitative approach, we were able to not only obtain a list of factors and elements, but also understand the reasoning and experiences of each expert for why a certain factor needed to be included or omitted from the model. Then, when we already had the qualitative arguments for creating the model, we proceeded to use quantitative approaches in order to give further rigor and validity to the model. We achieved this by using the ISM technique and by conducting an empirical validation of the model using SEM-PLS modelling. Therefore, we believe that by using this hybrid approach, we managed to get the best out of both worlds (the quantitative and the qualitative), helping us achieve a better quality output for this thesis. Next in this chapter, we will present a brief explanation of all the research methods used in our research.

3.4 EXPLORATORY METHODS: SURVEYS[1]

The term "survey" is used to describe a method intended to collect information using a questionnaire. Surveys are a good method for obtaining information from large samples of the population. According to Isaac and Michael (1997), a survey research is used "to answer questions that have been raised, to solve problems that have been posed or observed, to assess needs and set goals, to determine whether or not specific objectives have been met, to establish baselines against which future comparisons can be made, to analyse trends across time, and generally, to describe what exists, in what amount, and in what context."

According to Kraemer (1991), there are usually three characteristics present in a survey research: it is used to quantitatively describe specific aspects of a given population; the data required for survey research are collected from people and are, therefore, subjective; and it uses a selected portion of the population from which the findings can later be generalized back to the population.

In terms of their strengths, surveys can include many different types and number of variables that can be studied, are usually cheap to develop and administer, and are relatively easy for generalizing (Bell, 1996). Surveys can also obtain information about attitudes and behaviours that would otherwise be difficult to measure using other research techniques (McIntyre, 1999). On the contrary, it is important to note that surveys only provide estimates for the true population, not exact measurements (Salant and Dillman, 1994). Also, given that the answers are given by people, biases may occur, either in the lack of response from intended participants, in the nature and accuracy of the responses that are received (Bell, 1996).

[1] This section is adapted from Glasow (2005)

3.4.1 SURVEY PROCESS

Any research team intending to conduct a good survey research should undertake four basic phases:

- Survey Design
- Survey Instrument Development
- Survey Execution
- Data Analysis and Reporting

3.4.1.1 SURVEY DESIGN

According to Levy and Lemeshow (1999), a survey design should start by developing a sampling plan, which is the methodology used to select the correct sample from the population to be used for the study and the choice of media through which the survey will be administered. Survey media include telephone and face-to-face interviews, as well as mailed or web-based surveys. Afterwards, procedures for obtaining population estimates from the sample data and for estimating the reliability of those population estimates must be established (Salant & Dillman, 1994).

From the different survey options available, the two most common are written and verbal surveys.

- *Written Surveys*

Written surveys may be distributed using either in paper or electronic format (web-based or email). They require minimum resources -in terms of staff, time, and cost- and are best suited to guarantee confidentiality of respondents' answers. There are minimal interviewer and respondent measurement errors due to the absence of direct contact. Among the disadvantages of written surveys are their subjectivity to certain types of error. For example, written surveys are subject to coverage error where population lists are incomplete or out of date. They are also typically subject to non-response error (Isaac & Michael, 1997). Finally, due to the lack of control from the research team, item non-response where some questions may be inadvertently or intentionally skipped can happen (Salant & Dillman, 1994).

- *Verbal Surveys*

Verbal surveys include telephone and face-to-face interviews. The face-to-face interview is a good tool to capture verbal inflexion, gestures, and other body language, from which a skilled interviewer can obtain additional insights into the answers provided (Isaac & Michael, 1997). Face-to-face interviews are useful to get answers to either long or complex questionnaires and for reaching the correct respondents (purposive sampling). For example, semi-structured interviews (a form of verbal surveys) are excellent tools for interacting with the respondents and help the researcher extract all relevant information about a complex subject of study, something that would be very difficult to achieve with structured written surveys. Verbal surveys are, however, resource intensive in terms of staff, facilities, and time. In addition, results from face-to-face interviews are, generally, difficult to summarize and incorporate into data analyses (Isaac & Michael, 1997).

3.4.1.2 SURVEY INSTRUMENT DEVELOPMENT

Researchers must be careful when developing the survey instrument or questionnaire. First, the focus and objectives of the study must be carefully defined. Second, good and measurable questions must be developed in order to achieve the intended objectives (Salant & Dillman, 1994). Finally, the survey must be consistently administered (Fowler & Floyd, 1995).

Levy and Lemeshow (1999) argued that a statistician should be within the research group to provide input on the procedures that will be used to ascertain the quality of the data collected by the questionnaire. Attention should be also paid to the fact that the instrument should be easy to complete by the respondent -short in length, avoid complex vocabulary, easy to understand instructions, avoid biased wording, and be feasible to answer and ethical- as well as being easy for data processing and manipulation for analysis.

Finally, attention should be paid to the type of questions used in the questionnaire. For example, open-ended questions allow respondents to answer in their own words, and allow the researcher to explore ideas that would not otherwise be discussed. These kind of questions are ideal for semi-structured

interviews, because they allow the respondent to respond freely and give tips to the researcher as to which extra questions or comments should be brought up during the rest of the interview. Yet, open-ended questions require greater effort on the part of the respondent -and are, therefore, more time intensive to answer- and the results obtained are also more difficult to analyse. On the other hand, Closed-ended questions, typically with ordered choices requiring the respondent to examine each possible response independent of the other choices, are easier to answer and to analyse. Yet, the information taken from this kind of questions is limited to the pre-established knowledge from the research group, since both the questions and the possible answers are given beforehand.

3.4.1.3 SURVEY EXECUTION

The third phase of the survey process involves the use of the survey instrument. Salant and Dillman (1994) emphasized the importance of maintaining the confidentiality of individual responses and reporting survey results only in an aggregate way. The research team should also try to make survey participation a voluntary event, requiring the researchers to encourage participation and avoiding any form of pressure or coercion of the participants.

A good practice before applying the survey to the whole selected sample is to conduct a pilot survey, to test both the instrument and the procedures (Levy & Lemeshow, 1999). Survey questions can be evaluated using focus group discussions, cognitive interviews to respondents, and pilot tests of surveys under field conditions (Fowler, 1995). Surveys can also be evaluated by measuring the consistency of responses to given questions over time.

Field-testing the instrument facilitates later data collection and analysis (Isaac & Michael, 1997). Once field-testing has been completed, the survey is conducted and the data are collected, coded, and processed.

3.4.1.4 DATA ANALYSIS AND REPORTING

Once the survey has been administered, it is essential to consider the different data analysis techniques. It is important that the research team has a clear idea of how the data is going to be analysed (and which techniques are going to be used) during the planning of the survey and during the design of the questionnaire. This is important because each technique (especially more advanced statistical techniques) has its specific requirements in terms of the sample and the characteristics of the data.

In order to facilitate understanding, the details of the different statistical methods used to analyse the exploratory surveys conducted will be explained with its use in Chapter 4.

3.5 DESIGN AND VALIDATION OF THE CIAM MODEL

Designing and validating a model with the characteristics of CIAM requires taking certain steps in order to ensure scientific rigor. These steps will allow the research team to develop and validate the different elements within a model in a coherent and clear way. They also make the model more solid and the conclusions derived from it be more valuable for the academic and practitioner communities.

In general, when developing and validating a relationship model with latent variables (variables that cannot be directly observed or measured), the validation process includes two steps. First, the researcher needs to check that the measurement model (the model of variables and items within these variables) is valid and reliable. The measurement model is, basically, the list of variables and items required to test the model. Checking for its reliability and validity is essentially verifying, using different qualitative and quantitative methods, that the model actually measures what it intended to measure. After the measurement model has been tested, the researcher needs to check the validity of the different relationships formulated in the model.

There are several articles in literature about how to proper develop a measurement model and how to test relationship models. In this thesis, Mackenzie et al. (2011) and Hair et al. (2011) have been used as guides for developing the measurement model and the relationship model respectively.

Mackenzie et al. (2011) presents a guide containing 6 phases with 10 steps for a proper development of a measurement scale (Figure 9). All 10 of the steps outlined are suggested as important for the development of valid scales. Nevertheless, Mackenzie et al. recognize that practical limitations (such as lack of enough time or resources) may prevent researchers from being able to follow all of the recommendations. Consequently, the goal was not to articulate every possible technique that researchers should use to validate newly developed scales, but to provide a set of guidelines that researchers could use to improve the quality of measures used in research in the behavioural sciences. With this in mind, some suggestions for establishing priorities are presented.

For example, they say that it is important to have a clear conceptual definition of the constructs and items. In particular, they recommend to pay more attention to the front-end of the process—by providing a clear conceptual definition and developing adequate indicators (Step 1, 2, 3 and 4)—than on cross-validating the scale and developing norms for it (Step 9 and 10). Furthermore, they mention that another way to prioritize might be to combine some of the steps in the process, such as combining the scale evaluation and refinement and the validation process (Steps 5, 6 and 7). Finally, in the case of assessing validation of newly established scales, researchers should wait to have a sufficient amount of answers and datasets before attempting to create new norms for the scale. The authors do recommend to rigorously testing whether scores on the scale relate with the phenomenon the scale is intended to measure, either through the use of experimental manipulations of the focal construct, comparisons of groups known to differ on the focal construct, or tests of the relationships between the focal construct and other constructs.

Likewise, the paper from Hair et al. (2011) presents a guide for validating a relationship model developed through SEM-PLS techniques (this technique will be furthered explained later in this chapter). In their article they argue that the

basic SEM-PLS algorithm, used to validate a relationship structural model, follows a two-stage approach, with stage one about estimating the latent constructs' scores via a four-step process, and stage two about calculating the final estimates for the variables and the relationships. They also provide some rules of thumb for the measurement and relationship model evaluation.

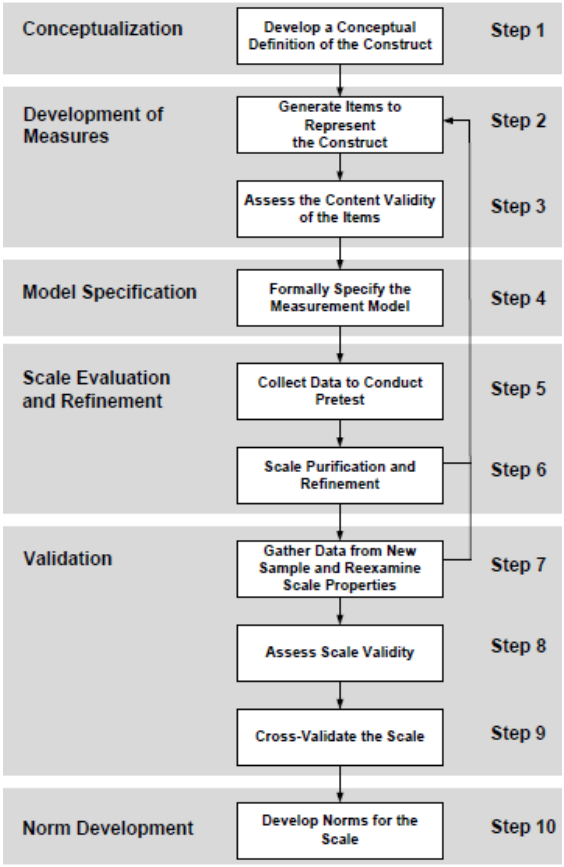

Figure 9 - Scale Development Procedure taken from Mackenzie et al. (2011)

In this thesis, we followed the guidelines of these two articles. In particular, we used the Delphi study and the literature review to conduct the conceptualization and development of the measurement model (Steps 1 to 3 in Mackenzie et al., 2011). Based on the Delphi results, we formally specify the measurement model (Step 4). Given time and resource constrains to achieve large samples of data, we combined the scale evaluation and refinement and the

evaluation process, by making only one empirical validation using data from an industrial company (Steps 5 to 7). Based on the aforementioned recommendations, we furthered assessed scale validity by examining at the way the different constructs relate between each other, by looking at the relationship model (Step 8). This was accomplished through the ISM technique and the statistical validation using SEM-PLS. In this case, the recommendations of Hair et al. (2011) were used to validate both the measurement and the relationship model. We do acknowledge that further scale validation could be an interesting future step to conduct beyond this thesis. Finally, because this is a newly established model and given some limitations in achieving large samples of data from different groups, the cross-validation and the norm development stages have been left for future lines of research.

Next, a more detailed explanation of the characteristics and benefits of using Delphi study, ISM and SEM-PLS as techniques for developing and validating a measurement and relationship model is presented.

3.5.1 DELPHI STUDY

The Delphi technique is a survey method used to facilitate an efficient group dynamic discussion, intended to reach a reliable group opinion about a complex problem by use of a series of questionnaires combined with controlled feedback (Linstone & Turoff 1975; Landeta 2006). This technique, designed to handle opinions rather than objective facts, is very appropriate for exploratory theory building on interdisciplinary or complex issues (Akkermans et al. 2003). It has been proven as a valid technique to aid decision-making based on opinions of experts, with more than a thousand articles published using it since its introduction in the late 1940s, and with successful applications in problems in similar fields to the one studied in this thesis (Landeta 2006; Melnyk et al. 2009; Akkermans et al. 2003).

Although there are many differences in the focus and procedures used for conducting a Delphi, four distinct characteristics usually remain the same: anonymity, iteration, controlled feedback, statistical group response (Von der Gracht 2012). By anonymity, it is meant that participants only interact directly

with a moderator, being this person the one in charge of analysing all responses and sending the feedbacks and instructions. This anonymity helps participants to respond more freely and sincere, allowing for a more successful research (Landeta 2006). By iteration, it is meant that the process is executed through a series of rounds in which the answers of participants are summarized by the moderator and provided as feedback for the next round. This is done until stability in the answers (and not necessarily consensus) is obtained (Linstone & Turoff 2011). The termed "controlled feedback" is because the moderator of the study decides on the type of feedback and information given to all participants, trying to eliminate all irrelevant information or noise from the discussion (Landeta 2006). Finally, statistical response can be shown either numerically or in the form of graphs, usually showing measures of central tendency (means) and dispersion or frequency distributions (Von der Gracht 2012). This helps participants to decide whether to change their previous answers or stay with their initial decisions.

The specific details of how we conducted the Delphi study will be explained along with its results in Chapter 5.

3.5.1.1 EXPERT PANEL SELECTION

A Delphi study does not depend on a statistical sample representative of any population. On the contrary, it is a group decision mechanism that requires qualified experts with deep understanding of the issues being analysed (Okoli & Pawlowski 2004). Therefore, it is critical for the success of the Delphi a good panel selection.

In terms of the size of the sample, Okoli and Pawlowski (2004) recommend between 10-18 experts per panel as a sufficient number, while Akkermans et al. (2003) recommends at least 20 respondents to overcome risks of individual biases contaminating the aggregate responses.

To select the experts a multi-step procedure, based on the one found in Okoli and Pawlowski (2004), was used and is shown in Figure 10. The full details of the criteria used to select the final list of experts will be further explained in Chapter 5.

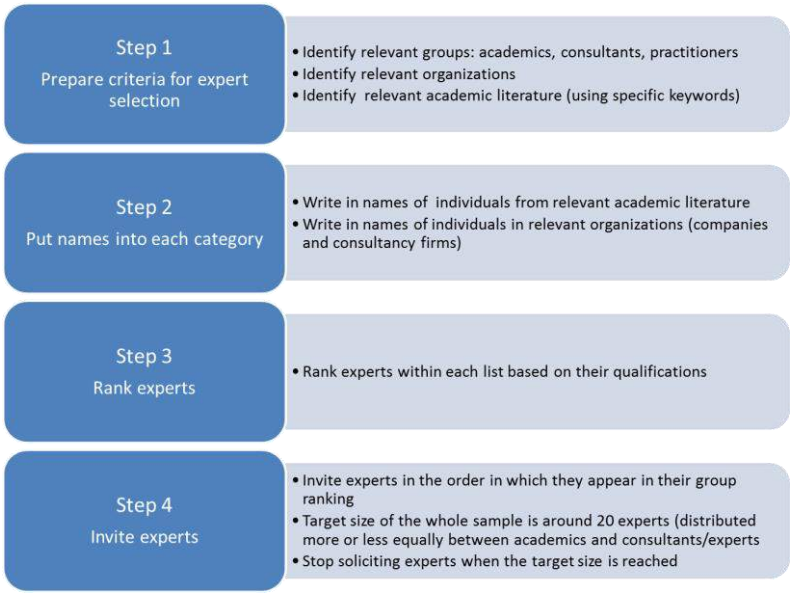

Figure 10 - Panel expert selection

3.5.2 ISM METHOD

ISM is an interactive learning process. The method is interpretive in the sense that it is the group's judgment the one that decides whether and how the items are related; it is structural because based on the relationship an overall structure is obtained; it is modelling, because the specific relationships and overall structure is shown in the form of a digraph model (Singh et al. 2007).

ISM is a process that enables groups of people to organize and explicit their collective knowledge in a structured way. It serves to transform unclear, poorly articulated mental models into visible and well-defined structural models (Attri et al. 2013). It uses mathematical algorithms that minimize the number of queries necessary for exploring relationships about a complex problem, like the one under consideration in this thesis (Attri et al. 2013).

ISM is therefore, a qualitative as well as quantitative, well established methodology for identifying relationships among specific elements, which define a certain problem (Jharkharia & Shankar 2004). ISM are used at a high level of

abstraction as well as at a more operational level to process and structure elements related to a complex problem such as engineering problems, decision making problems, human resource or competitive analysis (Attri et al. 2013b). The application of ISM approach to analyse systems and problems in various fields (such as TQM, supply chain management, knowledge management, logistics, productivity improvement, IT enablement, waste management) is well documented in existing literature (Attri et al. 2013).

3.5.2.1 STEPS INVOLVED IN ISM TECHNIQUE

The various steps involved in the development of the ISM technique are based on Singh et al. (2007) and are shown below in Figure 11. In order to facilitate understanding, the details followed in each step will be explained with its use in Chapter 5.

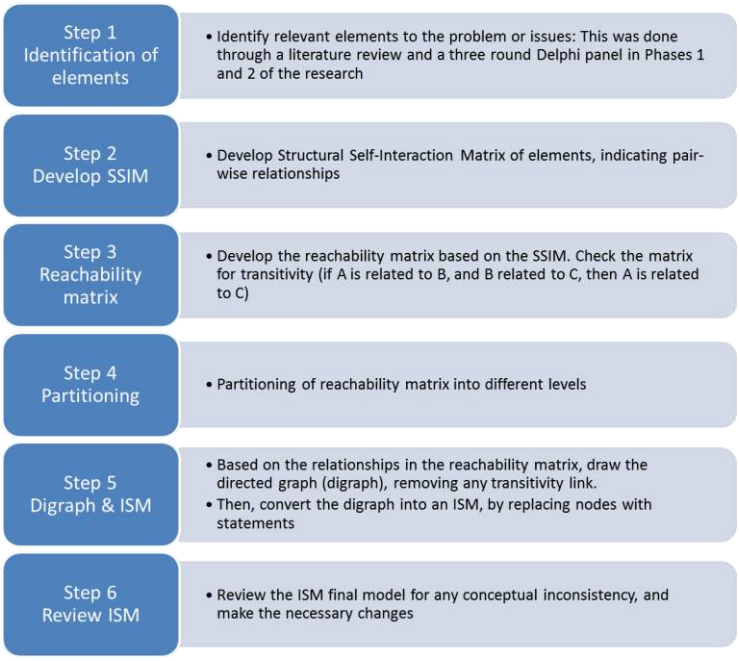

Figure 11 - ISM steps

3.5.3 SEM-PLS

The main purpose of statistical techniques is to estimate the probability that the pattern seen in the sample data collected could have occurred by chance instead of by the causes proposed by the theoretical model being tested (Lowry & Gaskin 2014).

Structural equation modelling (SEM) is a second-generation statistical technique appropriate for modeling causal relationships of effects in a simultaneous way. Causal modeling is based on defining variables and estimating possible statistical relationships among them to explain how changes in some variables result in changes to other variables within a given context. One of the main advantages of SEM is its ability to analyse relationships between latent (also known as unobserved variables), meaning that researchers are able to model abstract constructs comprised of many indicators (also known as observed variables), each of which is a reflection or a dimension of the latent construct. Furthermore, SEM enables to estimate complete causal networks simultaneously, allowing for testing complex theoretical models (Lowry & Gaskin 2014). Because of this, SEM is viewed as a the mix of two traditional approaches: an econometric approach focused on prediction and a psychometric approach that models concepts as latent variables indirectly inferred by multiple observed measures (Chin 1998).

In the area of organizational and management research, there is usually a need for measuring constructs indirectly through multiple measurement items (for example using a job satisfaction questionnaire because actual satisfaction cannot be directly measured). When indirect measures (variables offered as proxies for a construct) are used to gather data, measurement error is virtually guaranteed. Therefore, it becomes important to establish discriminant and convergent validity of one's measurement instruments before testing the theoretical model. In this sense, SEM offers the possibility of simultaneously test the convergent and discriminant validity and the reliability of the scales used to measure the theoretical constructs (testing the measurement model), and the proposed relationships or paths among theoretical constructs (testing the structural model).

There are basically two forms of SEM, a covariance based (CB) and a least squares or components based (PLS). CB SEM is very good for testing the full nomology of a known theory and testing general model fit, but it is very unreliable in the exploratory analysis required for theory building. Therefore, CB SEM should be used to test only well-established theories that are empirically validated (meaning using it for confirmatory analysis in which well-established theoretical arguments can be used to overrule competing explanations). In turn, PLS can provide advantages over the covariance form of SEM for preliminary theory building. The primary objective of PLS is to demonstrate that the alternative hypothesis is significant, allowing the researcher to reject a null hypothesis by showing significant t-values and a high R^2.

Given the case of this research, in which some of the hypothesis tested come from the adaptation of the TAM model and other hypothesis come from a theoretical discussion with a series of CI experts, the model being tested could be understood as a first step towards theory building of determinants of employee participation in CI. Therefore, using the SEM-PLS method has a better fit with the purpose of this research.

PLS offers flexible modelling through rigorous, robust statistical procedures (Wold 1979). Various authors support the use of PLS in the social sciences (Chin et al. 2003; Henseler et al. 2009; Hair et al. 2011) on the basis that it constitutes a statistical tool which is appropriate for theory construction and development and for testing theories which are at the development stage. The use of PLS here is, therefore, appropriate since this study presents a new theoretical approach to explain the influence of the variables that are related with employees' participation in CI. Furthermore, from the operational perspective, PLS has significant advantages over other similar methods due to the fact that the requirements it imposes in terms of measurement scales, sample sizes, and residual distributions are minimal (Chin et al. 2003). Finally, another advantage of this analytical method is that it allows complex models to be analysed with relatively small sample sizes (Chin & Newsted 1999). Some recommendations on when it is preferably or easier to use PLS and when to use CB-SEM is provided in Table 5.

Table 5 - Recommendations on when to use PLS versus CB-SEM (Adapted from Lowry and Gaskin, 2014 and Hair et al., 2011)

Model requirement	PLS	CB-SEM
Research goals		
Predicting key target constructs or identifying key "driver" constructs	*	
Theory testing, theory confirmation, or comparison		*
Research is exploratory or an extension of an existing structural theory	*	
Measurement Model Specification		
Includes formative constructs	*	
error terms require additional specification		*
Structural Model		
Structural model is complex (many constructs and many indicators)	*	
Model is non-recursive		*
The model includes multigroup moderators		*
The model includes interaction and moderation effects	*	
Data Characteristics		
Small sample size[1]	*	
Large sample size	*	*
Non-normal distribution of data	*	
Normal distribution of data	*	*
Nonhomogeneity of variance	*	
Non-convergence or no compliance with CB-SEM requirements	*[2]	
Model Evaluation		
Need to use latent variable scores in subsequent analyses	*	
A global goodness-of-fit criterion is required		*
Test for measurement model invariance		*

[1]SEM-PLS minimum sample size should be equal to the larger of the following: (1) ten times the largest number of formative indicators used to measure one construct or (2) ten times the largest number of structural paths directed at a particular latent construct in the structural model

[2]SEM-PLS results are a good approximation of CB-SEM results

3.5.3.1 APPLYING SEM-PLS

In order to conduct a proper SEM-PLS analysis, the researcher needs to:

- Have a theoretical model to test
- Have a measurement model to measure all variables and items included in the theoretical model being tested
- Run empirical validation of the measurement model
- Run empirical validation of the relationships hypothesised

As mentioned earlier, the theoretical model has to be pre-established before starting the PLS analysis. Therefore, researchers must either adopt a previously established model from literature, or develop a theoretical model based on existing theory (theory building).

Evaluating the measurement model[2]

The measurement model is, essentially, the list of variables (and items within these variables) that are needed to test the model. Usually in SEM analysis, variables are latent (meaning that they cannot be measured by observable metrics). Therefore, researchers must identify how to measure a specific latent variables, using as a proxy a set of items related to that variable. The relationship between the items and the variable can be in two ways. Items can either represent a reflection of the variable (called as reflective items), or items can define or be components of the variable (called formative items). Depending on this distinction, the analyses required or recommended in literature for conducting a proper empirical validation of the measurement model changes (Henseler et al. 2009).

Reflective measures

Reflective measurement models should be assessed with regard to their reliability and validity.

Reliability refers to the degree to which a scale produces consistent and stable measures over time. Reliability can be assessed using Cronbach's alpha index, in

[2] Based on Hair J., Ringle C., and Sarstedt M. (2011)

which a recommended value over 0.7 is necessary to retain indicators within the variable (Hair et al. 1995). Also, construct reliability assessment can be focused on composite reliability as an estimate of a construct's internal consistency. Composite reliability index (CRI) values of around 0.70 in exploratory research and values above 0.70 for more advanced stages of research are regarded as satisfactory (Nunnally & Bernstein 1994), whereas values below 0.60 indicate a lack of reliability and items should be removed. Furthermore, each indicator's reliability needs to be taken into account, by analysing that each indicator's absolute standardized loading is higher than the recommended value of 0.60 (Bagozzi & Yi 1988). Usually, indicators with loadings just below this value should only be removed from the scale if deleting them leads to an increase in composite reliability above the suggested threshold value. In addition, items should be checked to see whether they load with significant t-values on their latent constructs, using a process in PLS called bootstrapping (t-values were significant at the p-value of 0.05).

Reflective measurement models' validity assessment focuses on content validity, convergent validity and discriminant validity. First, it is important to establish content validity of all latent variables. This refers to the extent to which a group of variables represent all facets of a given construct or latent variable. Content validity generally requires the use of an expert panel, or a profound literature review, to evaluate whether the different items included actually defined each of the different latent variables intended to measure.

After content validity has been established, construct validity has to be justified, being its two necessary conditions to establish convergent and discriminant validity. To establish convergent validity, you need to show that measures that are supposed to be related are in reality related. For convergent validity, researchers should examine the average variance extracted (AVE). An AVE value of 0.50 and higher indicates a sufficient degree of convergent validity, as it means that the latent variable explains more than half of its indicators' variance.

In turn, to establish discriminant validity, you need to show that measures that are not supposed to be related are in reality not related. A usual way of

testing for discriminant validity is using correlation coefficients. Inter-correlations between two dissimilar variables should be low while correlations with similar variables should be substantially greater. In order to assess discriminant validity, two measures are typically used the Fornell–Larcker criterion and cross loadings. The Fornell–Larcker criterion (Fornell & Larcker 1981) argues that a latent construct shares more variance with its assigned indicators than with another latent variable in the measurement model. In statistical terms, the AVE of each latent construct should be greater than the latent construct's highest squared correlation with any other latent construct. For the cross-validation criteria, you need to check that the indicator's loading with its associated latent construct should be higher than its loadings with all the remaining constructs.

Formative measures

In a formative measurement model, indicators represent the latent construct's (potentially) independent causes and, therefore, do no need to necessarily correlate. In consequence, the already mentioned concepts of internal reliability and convergent validity are not meaningful when formative indicators are used. Instead, theoretical foundations and expert opinion play a more important role in the evaluation of formative items.

Yet, there are some statistical criteria that should be taken into consideration to better assess the different items. For example, given that the item is supposed to be forming the intended latent variable, one should look at the weight of each indicator to see whether it is relevant. In particular, one should look both at the size of the weight and at its significance. In addition to considering the significance of the indicator's weight, researchers should also evaluate an indicator's absolute importance for its construct through looking at its loading. When both weight and loading are non-significant, there is no empirical support for the indicator's relevance in providing content to the formative index. The choice of whether to eliminate or retain this item remains on the researcher, based on the theoretical assumptions and expectations previous to the empirical model. In any case, the researcher must either explain its reasoning for retaining the item or explain why the empirical model could have not supported the

theoretical assumptions. Finally, another important thing to check in formative measures is to determine redundancy, by examining the degree of multicollinearity within the formative indicators. In the context of PLS-SEM, this can be assessed by calculating the variance inflation factor (VIF). VIF value of 5 implies that 80 percent of an item's variance is accounted for by the remaining formative items included in the same construct, being this a sign of potential multicollinearity problems. To solve this, it is recommended to eliminate one of the items, choosing the least relevant one.

Evaluating the relationship model[3]

Once the measurement model has been tested for validity and reliability, it is necessary to check the validity of the different paths (or hypothesis formulated). This is done by looking at the different path coefficients given as an output of the PLS method.

In SEM, a path coefficient is the partial correlation coefficient between the independent variables and the dependent variables, adjusted for other independent variables. The individual path coefficients of the PLS structural model can be interpreted as standardized beta coefficients of ordinary least squares regressions. As with the indicators, significance (t-values) for all path coefficients must be checked to see whether they are statistical significant at the p-value of 0.05 (also using the bootstrapping method). Paths that are non-significant or that show opposite signs to the one hypothesized, do not support prior hypothesis. Meanwhile, significant paths showing the hypothesized direction empirically support the proposed causal relationship.

Once the full model had been tested, the predictive power of the model is checked, looking at the path coefficients and R^2 measures in the model. Because the goal of the PLS-SEM approach is to explain the endogenous latent variables' variance, the R^2 values of the key target constructs should be high. The judgment of what R^2 level is high depends, however, on the specific research discipline. As a reference value, to achieve meaningful predictive power, Chin (1998)

[3] Based on Hair J., Ringle C., and Sarstedt M. (2011)

recommended showing standardized paths of at least 0.20. In social studies, it is recommended to refer to three kind of relationships: around 0.25 are considered weak, around 0.5 are considered moderate, and above 0.75 are considered substantial or high.

Finally, besides evaluating the size of the R^2 values as a criterion of predictive accuracy, it is also interesting to analyse the Stone-Geisser's Q^2 value (Stone 1974; Geisser 1975) as a criterion of predictive relevance. The Q^2 value is obtained by using the blindfolding procedure, a sample reuse technique that omits every d^{th} data point part and uses the resulting estimates to predict the omitted part. It is important to note that the omission distance d must be chosen so that the number of valid observations divided by d is not an integer. Experience shows that d values between 5 and 10 are advantageous (Hair et al. 2011). It is important to mention that the blindfolding procedure is only applied to endogenous latent constructs that have a reflective measurement model specification (Hair et al. 2011). In the case of the structural model, Q^2 values larger than zero for a reflective endogenous latent variable indicate the path model's predictive relevance for this particular construct.

Bootstrap process

The bootstrap process enables the estimated coefficients in SEM-PLS to be tested for their significance (Henseler et al. 2009). SEM-PLS relies on a nonparametric bootstrap procedure to test the significance of estimated path coefficients in SEM-PLS (without the necessity of assuming normal distribution of data). Bootstrapping involves repeated random sampling with replacement from the original sample to create a bootstrap sample. This way, it obtains standard errors for hypothesis testing. The process assumes that the sample distribution is a reasonable representation of the intended population distribution.

Subsamples are created with randomly drawn observations from the original set of data (with replacement). The subsample is then used to estimate the PLS path model. This process is repeated until a large and pre-established number of random subsamples has been created, with a recommended value about 5,000.

Each bootstrap sample should have the same number of cases as the original sample. The parameter estimates (e.g., outer weights, outer loadings and path coefficients) estimated from the subsamples are used to derive standard errors for the estimates. With this information, student t-test are performed to assess each estimate's significance.

3.6 CONCLUSIONS

During this thesis, a mixed approach has been adopted, by using both qualitative and quantitative methodologies to fulfil the research objectives.

In particular, the thesis started with an exploratory phase, based on the use of surveys and semi-structured interviews, in order to detect the main challenges that companies still face when trying to implement and sustain CI systems. The preliminary findings from this exploratory phase, together with the results from the literature review previously explained, suggested that although employee participation is essential for the success of CI systems, the reasons why employees choose to participate are still not clear and more research on this topic is needed. Moreover, a lack of specific metrics and tools to measure and analyse employee participation and their main antecedents was found.

Based on these results, a second phase of the research was conducted. The main objective of this second phase was to develop and present a first empirical validation of a model called CIAM (continuous improvement acceptance model), which seeks to understand the main organizational variables affecting employee participation.

Further details on the methodologies conducted and main results of each step of the thesis will be presented in the following chapters.

4 EXPLORATORY PHASE: CI IN SPAIN

4.1 MAIN CHALLENGES STILL FACED BY HIGH PERFORMANCE COMPANIES

This part represents the first step in the research strategy to present first-hand information about how companies really implement and organize their CI processes. It was based on semi-structured interviews in ten high performing companies in the Basque Country. The objective was to analyse the state of their CI processes, putting special focus on how the organizational structure integrates with the CI processes and what are the characteristics of the corresponding measurement system.

4.1.1 METHODOLOGY

To carry out this research an exploratory study was conducted in ten high performing companies in the Basque Country (representing 29% of Basque EFQM award-winning organizations in the last 15 years). This region in northern Spain is well known throughout Europe for its quality and prestige. As shown in Figure 12, the Basque Country (Euskadi) has received many EFQM recognitions in Europe from 2000 to 2015.

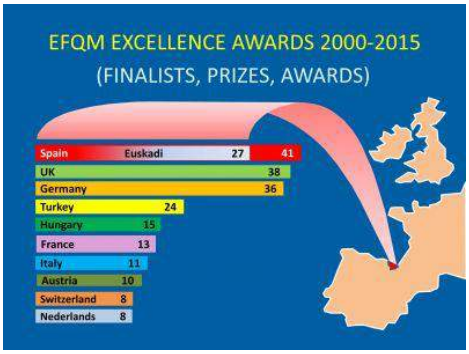

Figure 12 - EFQM recognitions in Europe. Taken from EUSKALIT (2015)

Ten companies were visited and semi-structured interviews were conducted in each of them in order to assess the current state of the management systems for their CI process and detect good practices. The interviews were conducted between September 2012 and December 2012 and were directed at companies with the following characteristics:

- Belong to the manufacturing sector
- Have more than 50 employees
- Have quality certifications (ISO family)
- Have EFQM recognitions

The first three criteria were compulsory, and the fourth one was preferred. Most of the interviews were answered by the people in charge of CI programmes.

The semi-structured questionnaire used for the interviews had four main sections. The first sought a general characterization of the CI process implemented. The second assessed the maturity level of the companies in terms of CI practices and behaviour. The levels were defined following the maturity model for CI defined by Bessant *et al.* (2001). The third section ascertained the habits and culture related to the use of metrics to manage and focus the CI process. The final section considered the barriers that prevent the sustainability of the CI process. The barriers considered for the questionnaire were selected from Albors and Hervas. *(2007)*.

4.1.2 CHARACTERIZATION OF THE COMPANIES VISITED

In terms of quality and excellence recognitions, the companies sampled have the following characteristics: three companies have received the Golden Q for receiving +500 points on the EFQM evaluation carried out by EUSKALIT, and five companies have received the Silver Q for receiving +400 points on the same evaluation. Moreover, all ten companies are certified according to the ISO 9001 standard. Finally, all companies indicated that they have been implementing CI systems in their organizations for more than five years.

The characterization of the sample is shown in Table 6. The manufacturing sector is divided as follows: three are in the machinery and electrical components sector (ME), two are in the machinery and mechanical components sector (MM); two are in the metal-based products (MB), three belongs to other industries (O). In terms of the number of employees, the characterization of the sample is the following: three have 50-150, three have 151-500, and four have over 500.

Table 6 - Characterization of the sample

	Nº of employees			
Sector	50-150	151-500	› 500	Total
ME	-	1	2	3
MM	-	1	1	2
MB	1	1	-	2
O	2	-	1	3
Total	3	3	4	10

4.1.3 RESULTS

4.1.3.1 MATURITY LEVEL OF CI

Using Bessant *et al.* (2001) classification, the results of the interviews show that the companies are, on average, closer to level 3, meaning that they have a structured CI process in place although it is still not 100 percent integrated into day-to-day operations. Although there is a considerable amount of empowerment with respect to operative activities, the same empowerment is not seen for developing CI projects.

Even though two companies seem to be reaching level 4, most of the companies failed to give consistent evidence of having organizational learning processes in place, as mainly seen in the lack of available documentation about past improvement activities. In most of the companies visited, managers could not show written evidence of previous improvement activities (although they knew them and could show them in practice on the shop-floor).

Several reasons seem possible to explain this lack of documentation. First, improvement activities are generally the consequence of firefighting activities, where the priority is on the fixing of the problem and leaving the documentation process is left in second place. Second, the lack of a systematic approach towards the documentation of CI activities is noticeable. This would mean that information exists, but as there is no process for fully documenting these activities, the way the information is kept is rather messy, making it difficult to retrieve it when necessary. Third, there may be a lack of standardization and clarity in the process used for the PDCA cycle. If the steps are not clear or if the process changes from improvement to improvement, then the documentation process will be much more time-consuming and will therefore be dismissed. Finally, most companies are missing a clear improvement process owner. The result of this would be that there is no one who is really responsible for overseeing the whole process, which means that there is no need to have all the information consolidated in one place and in one specific format. Rather, each department or "mini-company" will have parts of the documentation on the improvement activities, which will depend on what each one considers to be more relevant for future activities.

Finally, managers were asked to rank a set of barriers that were preventing them from reaching higher maturity levels and sustaining the CI process. The main barriers detected were: a lack of commitment from top management, a lack of resources, the lack of a clear measurement and management system for the CI process, and difficulties in achieving a sustainable improvement culture in the company.

4.1.3.2 ORGANIZATIONAL STRUCTURE FOR CI

All the companies visited claimed to have a business process management system (BPM). In particular, most of the companies are adopting an organizational model known as "mini-companies". This could be explained by the fact that many companies in the Basque Country are organized as cooperatives. De Leede and Looise (1999) used this term as a metaphor to describe the organization of a factory into semi-autonomous groups with the following characteristics: a) the name and mission statement is developed by the mini-company itself; b) there are clear client(s) and supplier(s), and the mini-company is responsible for managing the relationships with both; c) it is responsible for its own CI process; d) all the information about the mini-company's characteristics, processes and improvement activities should be displayed on the walls for everyone to see and understand.

This model is particularly interesting for promoting and sustaining the CI process as it enables people to commit to an entire working process and play a role in its failures and successes.

However, most of the companies visited were still in the process of giving this self-autonomy to its mini-companies, so many of the aspects presented above were still not fulfilled. Moreover, although managers agreed about the benefits of this management approach in terms of achieving greater commitment from their employees, its benefits in sustaining a global CI process were not so clear. Some of the main disadvantages detected during the interviews were the great dependence on each mini-company's leader to direct the CI efforts, and the difficulties in transferring good practices from one mini-company to another.

With regard to the first problem, the main issue according to some managers was that the level of employee involvement as well as the strategies and continuity of the improvement processes varied a lot depending on the characteristics and personality of the team leader. Moreover, the possible rotation of mini-companies' leaders could accentuate the instability of the continuous process inside the mini-company. With respect to the second problem, one manager said that the autonomy of each mini-company in managing its own CI activities leads to problems in transferring the knowledge

between mini-companies. This is because each mini-company could, eventually, develop its own strategies, create their own metrics to control the CI process, and set their own documentation policy, all which hinders the organization's knowledge-transfer capacity as a whole. These two problems together can affect the progress and sustainability of the company's global CI process, which is what, determines the competitiveness of the organization.

In terms of the overall CI process, a lack of visibility was detected for the process as a whole. Although all the companies claimed to have clear goals and objectives to focus the company's CI process, they usually failed in presenting concrete improvement goals other than the general strategic goals of the organization. Moreover, there was a general lack of a clear owner of the CI process. Instead, the process was embedded in the rest of the management system, and its management and monitoring was dispersed among all the department managers, process managers, and mini-companies leaders. This lead to certain problems in focusing and encompassing the CI efforts of the company towards a unique set of goals, defined by the strategy of the organization.

4.1.3.3 METRICS AND MOTIVATION OF CI

Questions about the use of specific metrics to ascertain the fulfilling of the strategic goals for CI were asked. In this area, managers claimed to have these kinds of metrics, although they did not have them grouped altogether into a specific scorecard. Once again, this could be explained by the lack of a clear improvement process owner, who would need to have these all-around metrics in order to have a complete perspective of the whole improvement process.

Another issue detected during the interviews was the general lack of metrics related to the CI process itself. This refers to metrics that reflect the state of the current process in terms of its critical success factors such as top management leadership, employee involvement, employee satisfaction, resources allocated, productivity indexes (number of suggestions and projects), rejection rates of suggestions and projects, etc. What was seen during the visits was that companies tend to have continuous measures of some of the latter metrics (productivity ones) but usually do not measure the rest, or at the most measure

some of them in an occasional and informal way. This lack of metrics could be related to the great difficulty that managers saw in quantifying the impact of each activity related to the improvement process (training, meetings, projects, etc.), mainly because the results came from the use of intangible assets.

In terms of the shop-floor and communication with employees, most of the companies visited had a set of metrics, usually associated with the productive process, which they use to monitor, in a continuous way, the improvement of the company. These metrics were usually displayed on boards located next to the productive process on the shop-floor. This is related to the great importance that all companies gave to the use of Visual Management elements throughout the entire organization, as a way of improving communication and motivation of the employees (Jaca et al., 2014). In most cases, these boards were updated on a monthly basis. The metrics used were productivity rates, product quality metrics, 5S audits results, employee polyvalence matrix, absenteeism, and costs. In some few cases, metrics related to the level of employee participation in improvement activities were displayed. In even fewer cases, information about the state of suggestions made by employees or information about improvement activities in process were shown.

Finally, regarding the motivational aspect, the rewarding system for promoting the CI was analysed. Only half of the visited companies had implemented some kind of recognition system to reward employees for their efforts and results within the CI process. Moreover, almost half of the positive respondents said their recognition systems were based on economic rewards (bonuses, dinners or trips), while the other half said it had non-economic rewards (public recognition at meetings or extra days-off). Very few companies had both systems implemented.

The responses of managers against giving rewards for CI efforts pointed to the belief that these kinds of rewards created some kind of unhealthy competition between co-workers. Moreover, some managers that had reward systems in the past but later abandoned them, said that workers were more concerned about getting the prize than actually worrying about business performance improvement.

4.1.4 CONCLUSIONS FORM THE SEMI-STRUCTURED INTERVIEWS

This study analysed ten top performing companies that have been recognized for their achievements in quality and business excellence. All companies were aware of the strategic importance of CI, and reported that they are committed to this endeavour. On average, the companies visited were still at approximately level 3 of Bessant et al. (2001) CI maturity levels. Therefore, many gaps were detected, and these gaps are keeping the companies from reaching level 5 of the model. First, companies did not have a clear person in charge of the CI process. The lack of process owner can make the process be more chaotic and fragmented, consuming resources and strengths but not being very effective. Furthermore, companies were seen to have a poor measurement system for the CI process, and there was a particular lack of effective metrics that reflect the state, improvement and sustainability of the CI process itself. This lack of metrics also affects the decision making process of managers, which diminishes even further the capacity to focus and unite all the CI efforts throughout the organization around a sustainable strategy for business excellence and growth.

4.2 CI CHALLENGES: A SURVEY OF SPANISH SANUFACTURERS

This section looks to extend the results from the previous section by analysing the level of implementation in manufacturing companies of 16 CI routines, and how these routines foster CI and employee participation. This study is based on a general web-based survey conducted among CI managers from Spanish manufacturing firms, with a special focus on the Autonomous Communities of the Basque Country and Navarra as they are both well-known references for quality and business excellence, which yielded 147 valid responses. Cluster analysis and Factorial analysis were performed in order to group both the responses and the variables used into more comprehensive categories. Statistical tests were run to test for significant relationships.

4.2.1 METHODOLOGY

The method selected to conduct this study was a general survey aimed at the CI managers. The survey was intended to cover Spanish firms, with focus in the autonomous communities of the Basque Country and Navarra, both in northern Spain. These two regions have a long tradition and experience in both quality management and CI, and they enjoy prestige with regard to management excellence recognitions.

Two main objectives guided this research. On the one hand, this research was designed to shed light onto the issue of how Spanish companies are implementing their CI systems. In particular, based on the experience from previous research about the implementation and maturity of CI practices and habits in Spain, this research tried to demonstrate that Spanish companies still have room for improvement when comparing their practices to the relevant literature in the CI and management field. On the other hand, this research was intended to explore possible empirical relationships between the implementation level of CI routines within companies and the participation of all employees, as well as with the perceived sustainability of the CI system.

Our research questions were:

RQ1. What level of implementation of CI routines do Spanish companies have? Can these routines be reduced to a set of factors?

RQ2. Can these companies be clustered into more meaningful and reduced sets of groups based on their score for the CI routines?

RQ3. How do the companies surveyed perceive the sustainability of their CI system? Does it depend upon the implementation level of a series of routines known in the literature to be enablers of CI success?

RQ4. Is there any relationship between the development of these CI routines and the level of perceived employee participation in the CI system?

RQ5. Are these companies taking a holistic approach when choosing how to measure the CI system? Does it depend upon the implementation of the CI routines?

4.2.1.1 SELECTION OF THE SAMPLE

This research was intended for the Spanish industrial sector, with focus on companies in the Basque Country and Navarra. Therefore, the chosen sample was based on data from different industry-based databases. In total, a list of 1548 companies was drawn up. From that, a total of 147 valid answers were obtained, resulting in 9.5% response rate.

4.2.1.2 DESIGN OF THE QUESTIONNAIRE

The questionnaire had three main sections. Section 1 consisted of a series of questions that characterized the companies surveyed. Section 2 consisted of questions about the implementation of certain CI routines in the companies. Section 3 consisted of a series of questions regarding measurement and management of the CI systems.

Section 2 of the survey consisted of a series of questions intended to assess the implementation level of certain routines considered to be important to having successful CI systems. A total of 16 questions (v1-v16) were asked based on the description of CI routines appearing in Bessant et al. (2001) CI maturity model. This framework is one of the most recognized normative frameworks for developing CI (Jørgensen et al. 2006; Garcia-Sabater et al. 2012), and it has been used as a basis for other similar studies about CI implementation in countries in Europe, Asia and Australia (Jørgensen et al. 2006; Corso et al. 2007; Albors & Hervas 2007). For these 16 questions a 7-point Likert scale was selected.

- V1 - A designated individual or group monitors the CI system and measures the incidence (i.e. frequency and location) and the results of CI activity.
- V2 - There is a cyclical planning process whereby the CI system is regularly reviewed and, if necessary, amended.
- V3 - There is periodic review of the CI system in relation to the organization as a whole, which may lead to a major regeneration of the system itself.

- V4 - Senior management makes sufficient resources (time, money, personnel) available in order to support the ongoing development of the CI system.
- V5 - Employees make use of some kind of formal (structured) problem-finding and solving cycle.
- V6 - CI activities have been integrated into day-to- day operations; they are not just occasional bursts of improvement.
- V7 - Employees (as individuals and/or groups) assess their proposed changes against departmental or company objectives in order to ensure the changes are consistent with the objectives (before embarking on initial investigation and before implementing a solution).
- V8 - Employees have full autonomy to experiment and make improvements within their workplaces.
- V9 - The organization uses specific mechanisms to deploy the learning that is captured across the organization in connection with all CI activities.
- V10 - The company has clearly defined goals and objectives to guide the CI process.
- V11 - The goals and objectives for the CI process are aligned with the business strategy of the company.
- V12 - The goals and objectives for the CI process are communicated to all employees.
- V13 - The goals and objectives guiding the CI process are deployed to the lower levels of the organization.
- V14 - Specific sets of metrics are used to manage all CI activities.
- V15 - These metrics are grouped and displayed in a single scorecard, which is used to manage the CI process.
- V16 - The company uses a formal system to manage and control all CI activities.

In section 3, in order to explore the possible relationship between these routines and the perception of sustainability, a specific question about how sustainable a company's CI systems have been (in terms of activity level and

results) over the last three years was asked. Finally, three questions assessed the level of employee participation, which were also based on Bessant et al. (2001) and previous CI related surveys. Finally, one question was included about the use of specific metrics to measure the CI systems, using a categorization adapted from the one used in Jaca et al. (2011).

Once the questionnaire was verified and approved, it was uploaded into a web-based platform. After the web-based questionnaire was ready to use, an internal pilot test was conducted with colleagues from our university in order to ensure that the link provided to answer the survey worked correctly and that the results were collected correctly. Then, an external pilot test was done with CI experts to ensure that there were no mistakes in the questions and that all questions were understood correctly.

4.2.1.3 CONDUCTING THE SURVEY

The survey was conducted during 2013. All companies were contacted through their e-mail addresses. The survey was presented as a link to a web page, included in a cover letter explaining the purpose and characteristics of the research. The survey was intended to last no more than 10 minutes and it was intended to be answered by the person in charge of the CI systems/programs inside the companies. In order to improve the response rate, after the first round of e-mails, two more reminder rounds were sent. Results were then collected and analysed.

4.2.1.4 ANALYSIS OF DATA

The Minitab 16® and SPSS® statistical packages were used for statistical tests. First, a general analysis was carried out in order to look for possible trends. Furthermore, Chi square tests were run to test for significant relationships between some of the characterization variables and the rest of the results gathered.

Exploratory Factor Analysis was conducted to check for the possibility of reducing the 16 variables (v1-v16) into a set of factors. Factor analysis (FA) is a

generic name for a class of statistical multivariate methods that have the aim of representing the interrelationships among a set of variables (V) by a number of underlying, linearly independent reference variables called factors (F), where F < V. The main goals of factor analysis techniques are to reduce the number of variables and to detect underlying internal structures within the relationship between variables (Hair et al. 1995).

Given the number of answers, a Cluster Analysis (CA) was done in order to better assess possible trends and relationships among the different variables included in the survey. CA is of special interest for researchers looking to unveil a sort of natural structure between the observations based upon a multivariate profile (Hair et al. 1995; Yeung et al. 2003). It is a multivariate technique that groups individuals into different clusters. The idea behind this type of technique is to maximize the homogeneity of the objects inside each cluster while maximizing the heterogeneity between the different clusters. CA is a very useful technique in many situations. One that is of particular interest is using it to reduce the data gathered from individuals through a general survey into a more meaningful and reduced set of groups (Hair et al. 1995).

One-way ANOVA tests were run to test for significant differences between the mean scores of relevant variables within the clusters created. In the cases were the ANOVA results show significant differences between the mean scores, Fisher's LSD method was used to comparing the means of the treatment groups (using Individual confidence intervals of 95%).

4.2.2 CHARACTERIZATION OF THE COMPANIES SURVEYED

A total of 218 responses were received, and of those 147 were considered to be valid and complete responses (only questionnaires containing no blank or missing answers were considered given the holistic approach used to analyse the responses). The characterization of the answers is shown in Tables 7 and 8.

Table 7 - Characterization according to region, number of employees, implementation of formal CI systems, N=147

Region		Nº Employees		Years implementing CI systems	
Navarra	37.4%	‹50	17.7%	› 10 years	45.6%
Basque Country	39.5%	50-250	52.4%	5 - 10 years	32.0%
Rest of Spain	23.1%	251-500	12.2%	‹ 5 years	19.0%
		›500	17.7%	There is no formal Ci system in place	3.4%

Table 8 - Characterization according to quality and excellence certifications and documentation of CI system, N=147

Documentation of the CI system		Certifications & Recognitions	Yes	NO
No existing documentation about the CI system	6.8%	ISO 9001	81.6%	18.4%
CI has a section within some of the business processes	23.8%	EFQM recognitions	18.4%	81.6%
CI has a section within all of the business processes	17.7%	Other certifications	57.10%	42.9%
There is a general layout of the CI system, cross-sectional to all the organization	33.3%			
There is a detailed layout of the CI system, with clearly defined information about roles, routines, communication channels, etc. within the system	18.4%			

As can be seen from the above tables, most answers are from the regions of Navarra and the Basque Country and are primarily SMEs (less than 250 employees). Moreover, most companies have more than 10 years of experience implementing formal CI systems and most of them have some kind of certification or recognition related to quality management or process excellence. Nevertheless, less than 20% of the respondents claimed to have a CI system that is defined and documented in detail with all the routines, roles and communication channels for the CI system.

After conducting several chi-square tests, the only characterization variable that was found to be significant was the detail with which the CI system was defined and documented. In particular, CI managers from companies that defined and documented their CI system with more detail thought that their CI system was more sustainable.

4.2.3 RESULTS

4.2.3.1 IMPLEMENTATION LEVEL OF CI ROUTINES

To answer to RQ1, a FA was conducted to check for the possibility of reducing the 16 used variables (v1-v16) into a set of factors. These factors could be used in future research when developing models relating the impact these variables have to attaining high level of employee participation.

The first step is to ascertain some degree of interdependence among variables to justify the application of the FA (a visual inspection of the matrix should reveal a substantial number of correlations above 0.3). Consequently, the correlation matrix was calculated and analysed to determine the suitability of the method. The determinant of $2.882E^{-6}$, the p-value of the Bartlett test minor to 0.001 and a Kaiser–Meyer–Olkin index of 0.910, indicated that this technique could be adequately applied (Hair et al. 1995).

For this study the principal component method was selected to extract the factors (Hair et al. 1995). To select the number of factors to extract, a criterion of eigenvalues above 0.7 was used. Moreover, a 'vari-max' method was selected for the rotation of the components in order to obtain a better interpretation of the groups. After rotation, the resulting matrix, which represents the relationship between the variables (CI habits and routines) and the rotated components (factorial loads), was analysed. The criteria chosen for obtaining a good solution were that the sum of the explained variance of all factors together exceeded 75 percent (which is a reference value for social studies) and that at least each factor was explained by three variables with significant factor loads. Taking all these criteria into consideration, the best solution was obtained with 4 independent factors; all four factors explained 75.3 percent of the variance. The resulting rotated component matrix coefficients are shown in Table 9; only coefficients above 0.30 were included, in order to simplify understanding. Furthermore, only coefficients above 0.45 were considered to finally form each factor based upon the number of observations studied.

Table 9 - Factor loads resulting from the Factor Analysis

	F1	F2	F3	F4
V1		**0.765**	0.362	
V2		**0.763**		0.308
V3	0.329	**0.788**		
V4	**0.520**	**0.562**		0.330
V5			0.491	**0.587**
V6	0.455	0.361	0.349	**0.481**
V7	**0.487**	0.309	0.326	0.415
V8				**0.750**
V9				**0.739**
V10	**0.781**		0.349	
V11	**0.814**			
V12	**0.808**			0.373
V13	**0.809**			0.347
V14	0.430	0.416	**0.702**	
V15	0.350		**0.814**	
V16	**0.545**	0.405	**0.593**	

The final four factors extracted were defined as follows:

- F1, named 'strategic approach of CI', was formed by variables V4, V7, V10 to V13 and V16. These variables show how well the company has established CI objectives and goals, how aligned these objectives are in regard to the rest of the strategic objectives of the company, and how well these objectives are deployed and communicated to the rest of the employees.
- F2, named 'improving the CI system', was formed by variables V1 to V4. These variables show whether the company has adequate systems, procedures and resources to continuously manage, revise and amend the CI system used.
- F3, named 'measuring CI', was formed by variables V14 to V16. These three variables show the use of specific metrics to control and manage the CI process.

- F4, named 'daily CI', was formed by variables V5, V6, V8 and V9. All these variables are related to the way the company implements CI in their daily operations by showing the support level it receives from both employees and managers and the empowerment companies give to their employees in terms of CI activities. They also show the presence of adequate knowledge sharing systems, allowing the company to grow as a whole.

Once the factors were defined, the score on each of the four factors was checked for all the surveyed companies. This would help to assess the level of implementation of CI routines that Spanish companies have. For each observation, to construct the scores for each factor, the literature recommends using additive scales. In particular, when the intention is to obtain scores that can then be easily generalized in the future, it is recommended to obtain the scores by averaging the scores of those variables that load highly on each factor (Hair et al. 1995). The scores are shown in Table 10.

Table 10 - Factor mean scores and standard deviation

	Mean	Stdev
F1	5,10	1,32
F2	5,07	1,45
F3	4,97	1,67
F4	4,43	1,24
N=147		

As shown in Table 10, most factors had a moderately high score but with a significant standard deviation. The strategic approach factor had the highest mean score and the daily deployment of CI the lowest.

4.2.3.2 CLUSTERING COMPANIES INTO MORE MEANINGFUL GROUPS

To answer research question RQ2, a CA was carried out. In contrast with other multivariate techniques, the theoretical value of the CA is rather subjective and depends on the researcher conducting the study (Hair et al. 1995). In this case, 147 valid answers were analysed using the 16 questions about CI routines asked in Section 2 of the survey as variables (V1-V16).

Given that all the variables were measured using the same 7-point scale, the normal Euclidean distance method was selected. After this, the method of linkage was selected. Two of the most frequently used methods are the single and complete method. Both methods are similar in concept in the way they chain individuals into clusters. The problem with the single method is that when observations are close together the method tends to identify long chain-like clusters that can actually put very dissimilar items together at either end of the chain cluster. The complete method solves this problem by ensuring that all items in a cluster are within a maximum distance (Hair et al. 1995). Therefore, the complete method was selected for this study.

Three clusters resulted from the analysis. The centroids for each of the clusters are plotted in Figure 13.

Figure 13 - Graphical representation of cluster centroids

For each of the clusters found, the mean scores for each of the four factors aforementioned in the FA were studied. The results are shown in Figure 14.

Appropriate names were given to each of the clusters found, based upon the results on each of the four factors:

- C1 – *CI Leaders*: companies with a very mature CI system based on the high scores on all four factors (84 companies in this category)
- C2 – *CI Followers*: companies with a good CI system in place, with medium-high scores on three out of four factors (42 companies in this category)
- C3 – *CI Laggards*: companies with a regular CI system, with medium-low scores on all four factors (21 companies in this category)

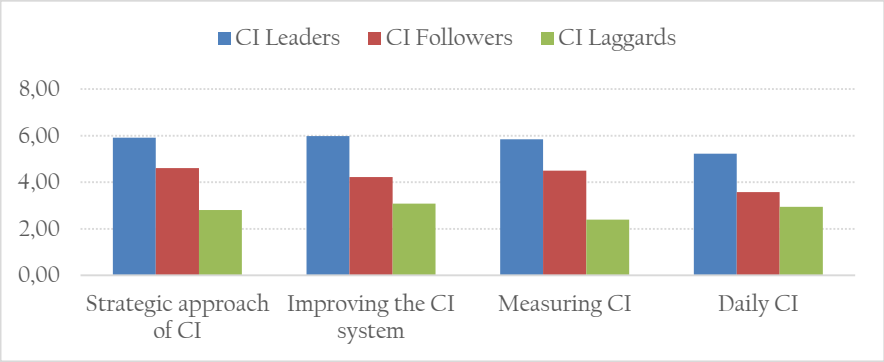

Figure 14 – Mean scores for each of the Factors within the clusters

4.2.3.3 CI SYSTEM SUSTAINABILITY

To answer research question RQ3, one-way ANOVA tests were conducted to study significant differences in the companies' scores in terms of their perception of the sustainability of their CI system.

The perception that CI managers had about the sustainability of the CI systems implemented in their companies was assessed. Based on a 7 point-scale, managers were asked whether their organization had been able to sustain its CI system in the last three years, understanding sustainability as maintaining or improving its level of activity and results (1 – it has not been sustained, 4 – it has

been sustained, 7- it has substantially improved). The mean scores were compared, taking into consideration the three clusters constructed in the previous section using one-way ANOVA (p-value<0.001). The results in Table 11 show that in the companies where the CI routines and habits are more developed, CI managers believe their systems are more sustainable over time.

Table 11 – ANOVA and Fisher's LSD results for perception of sustainability

Cluster	N	Mean	St. Dev.
CI Leaders	84	5.83*	1.10
CI Followers	42	4.98*	1.42
CI Laggards	21	3.62*	1.43

*Shows significant differences when comparing to both other means. P-value<0.001

Next, given that the general results from the survey showed that few companies have fully defined and documented their CI systems, the relationship between the documentation level of the CI systems and the perception managers had about the sustainability of their CI systems was also analysed using Chi-square tests to see whether there was any relationship. Results showed a significant relationship with a p-value < 0.001. Further ANOVA analysis reveals significant differences (p-value < 0.001) in the mean score for the perception of sustainability of CI systems, indicating that those companies that have stated to have more detailed documentation of the system also have a better perception of the sustainability of their CI systems.

4.2.3.4 EMPLOYEE PARTICIPATION

To answer research question RQ4, three questions assesses the level of employee participation, which were:

- EP1 - Employees (as individuals and/or groups) initiate and carry through CI activities – they participate in the whole process.

- EP2 - Employees understand and share a holistic view (process understanding and ownership).
- EP3 - Employees seek out opportunities for learning / personal development

For each of these questions, ANOVA tests were conducted, showing in all cases that the mean scores for *CI Leaders* were significantly higher than *CI Followers* and *CI Laggards* (p-value<0.001 in all three cases). Results are shown in Table 12. These results support a possible positive relationship between the CI routines and attaining highly committed employees.

Table 12 – ANOVA and Fisher's LSD results for Employees participation

		EP1		EP2		EP3	
Cluster	N	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
CI Leaders	84	5.48*	1.08	5.51*	1.21	5.27*	1.27
CI Followers	42	3.57	1.40	4.02	1.12	3.64	1.30
CI Laggards	21	3.24	1.26	3.67	1.20	3.28	1.31

*Shows significant differences when comparing to both other means. P-value<0.001 for EP1, EP2 and EP3

Additionally, managers were asked about whether the company considered using reward systems as an important tool to motivate employee participation in the CI process. An ANOVA test showed statistical differences in the mean score between the clusters (p-value=0.003), as shown in Table 13.

Table 13 - ANOVA and Fisher's LSD results for using reward system to promote participation

Cluster	N	Mean	St. Dev.
CI Leaders	84	5.00*	1.34
CI Followers	42	4.07	1.91
CI Laggards	21	4.05	1.88

*Shows significant differences when comparing to both other means. P-value=0.003

Then, chi-square tests were run to assess possible statistical differences between considering the use of reward systems as a way to promote employee participation and real participation. For these test, the three questions assessing participation (EP1, EP2, EP3) and the question about rewarding systems were re-coded for better visualization of the results (from a 7 point scale to a low-high

scale). The results in Table 14 support a possible positive relationship between the use of reward systems and attaining high participation.

- EP1 →EP1 cod
- EP2 →EP2 cod
- EP3 → EP3 cod
- The company considers reward systems to be an important tool to motivate employee participation in the CI process → C4 cod

Table 14 - Chi-square tests between reward systems and participation

C4 cod\EP1 cod	High	Low	C4 cod\EP2 cod	High	Low	C4 cod\EP3 cod	High	Low
High	63.86	36.14	High	69.51	30.49	High	66.67	33.33
Low	39.68	60.32	Low	46.03	53.97	Low	39.68	60.32
p-value=0.004			p-value=0.004			p-value=0.001		

4.2.3.5 USE OF SPECIFIC METRICS TO MANAGE THE CI SYSTEM

To answer research question RQ5, companies were asked about the use of metrics to measure specific areas of the CI systems, such as economic benefits, non-economic benefits, efficiency, and employee satisfaction, among others. The general results suggest a relatively poor use of specific metrics, and show that 8.2 percent of companies claimed to not be using any metric system to monitor the CI activities. In particular, Table 15 shows that although most companies reported measuring the efficiency of CI activities, only 50 percent of companies claim to be measuring the economic benefits of CI activities and less than 30 percent use metrics of non-economic benefits to monitor CI activities. Furthermore, less than 25 percent of companies said they were measuring the employees' degree of satisfaction when participating in CI activities and less than 30% claimed to be using measures of the organization's degree of satisfaction towards the CI system in general to monitor the CI activities.

Table 15 also shows the percentage of companies using each kind of metric in each cluster (Leaders, Followers and Beginners), expressed as percentage of the

total number of companies in each cluster. As can be inferred from the Table 16, *CI Leaders* score higher than the average, while *CI Beginners* scored lower than the average. The biggest differences are seen in the last three kinds of metrics (related to the employees' and stakeholders' satisfaction with the CI system and the company), in which *CI Leaders* scored between two and three times more than *CI Followers* and *CI Beginners*.

Table 15 - Description of specific metric usage percentage for each cluster and total of companies

Ref.	Description	%Usage Leaders	%Usage Followers	%Usage Laggards	%Usage Total
A	We do not use any metric system to monitor the CI activities	2.4%	9.5%	28.6%	8.2%
B	Measure the economic benefits of the implemented improvements	59.5%	42.9%	28.6%	50.3%
C	Measure the non-economic benefits of the implemented improvements	34.5%	23.8%	19.0%	29.3%
D	Measure the effectiveness of the implemented improvements	81.0%	66.7%	52.4%	72.8%
E	Measure the well-functioning of the CI system itself	63.1%	26.2%	38.1%	49.0%
F	Measure the employees' degree of satisfaction when participating in CI activities	31.0%	14.3%	9.5%	23.1%
G	Measure the organization's degree of satisfaction towards the CI system in general	34.5%	19.0%	14.3%	27.2%
H	Measure the stakeholders' degree of satisfaction towards the company (shareholders, clients, other interested groups)	35.7%	11.9%	9.5%	25.2%
	N=	84	42	21	147

4.2.4 CONCLUSIONS FROM THE SURVEY

A list of 16 enablers found in the CI literature as being critical for successful implementation were reduced to four independent factors that could be used in future research.

When looking at the scores obtained for the four factors extracted from the FA for *CI Leaders*, *CI Followers* and *CI Laggards*, it can be seen that companies that have better management systems (F1), better measurement systems (F2), a better strategic focus on CI (F3) and have better daily working and cultural habits (F4), believe to have a more sustainable CI system and a better level of employee participation. These results seem to support what the literature states about these four factors (represented by 16 variables) being common enablers needed to make any CI initiative successful and sustainable (Garcia-Sabater et al. 2012; Bessant et al. 2001).

In particular, it can be observed that *CI Leaders* -companies with a very mature CI system based on high scores on all four factors- gave more importance to the use of rewarding systems to promote employee participation, have a very good perception of the sustainability of their CI system (mean 5.83) and have high levels of employee participation (mean 5.48). Meanwhile, *CI Followers* - companies with a good CI system in place with medium-high scores on three out of four factors- achieve good levels of sustainability of the system (mean 4.98) but do not succeed in getting high levels of employee participation (mean 3.57). Finally, *CI Laggards* –companies that scored medium-low scores on all four factors- do not have a good perception of their CI system (mean 3.62) and do not believe they have high levels of employee participation (mean 3.24).

Going back to the results of the clusters in terms of the factors discovered in the FA, it is interesting to notice that in the case of CI leaders as well as in the case of CI followers, the least scored factor is the one corresponding to daily CI (this is also the least scored factor considering all answers). As mentioned previously in the result section, this factor includes variables related with management support, employee empowerment and the presence of adequate knowledge sharing systems, all necessary elements to allow the company to grow

as a whole. These results could raise the questions as to whether the fairly good results seen in CI leaders and followers will be sustained in time, given that these essential elements related to the daily management of the system are not taken care of properly.

When investigating for possible explanations for each cluster, some contingency tables were used again to assess possible statistical differences regarding the characterization variables. However, no statistical differences were observed. In particular, no significant relationship was found between the clusters and the age of the CI system or between the clusters and the size of the company. These findings could suggest the possibility of addressing CI systems as complex systems. A complex system can be defined as "a system formed out of many components whose behaviour is emergent, meaning that the behaviour of the system cannot be simply inferred from the behaviour of its components" (Bar-Yam 2003). The behaviour of a complex system must be understood not only by the behaviour of the parts but also by how they act together to form the behaviour of the whole. In other words, it is a system where everything is connected to everything else (Sterman 2001). Due to the impossibility of describing the whole without describing each part, and because each part must be described in relation to other parts, complex systems are difficult to understand (Bar-Yam 2003). If proven true, this could partially explain why many CI attempts fail even when companies try to repeat already proven successful initiatives as stated by many authors (Asif et al. 2009). This interdependence partially answers the question of why not all companies have achieved maximum benefits when implementing CI practices or why it is not enough to just pick a few techniques and implement them (Kaynak 2003). Instead, CI systems need to be nurtured and conceived from inside the company based on a series of common grounds that have been proved to be useful and critical regardless of the initiative conducted. This means that a holistic approach that looks at the interdependence of the different practices involved should be considered when trying to implement such system.

With regard to the measurement of the different aspects of the CI system, although companies which score high in the CI practices also score higher in all

types of measures, a relatively low use of specific metrics is observed. In particular, companies seem to be quite biased towards using metrics to measure the technical and financial aspects of the system but forget about other aspects related to the people involved in the organization. These results suggest that research related to the measurement of the CI system is still a valid topic that should be further studied. Moreover, this lack of people-oriented measures should trigger managers' alarms about how the CI system is being designed and managed, since resources are being spent on increasing people's participation but little feedback is being received about the effectiveness of these investments.

4.3 GENERAL CONCLUSIONS FROM THE EXPLORATORY PHASE

This step of the research provides new insights into the real implementation level of CI practices and habits in Spanish firms. Furthermore, given that the CI literature talks about the importance of employee participation in order to arrive at successful CI implementation and given the results obtained in both of these exploratory studies, future empirical research is needed to determine which CI practices or habits really affect employees' intentions to engage in CI activities. Although this study supports the idea of having these 16 routines as a necessary condition for achieving sustainable and collaborative CI systems, more research should be carried out to examine whether the implementation of these CI enablers is both a necessary and sufficient condition to obtain highly collaborative CI systems. Furthermore, given that the literature reports people's participation as being key to having sustainable CI systems, a question that remains open for future research is up to which point does people satisfaction towards the CI system and towards the company in general modify their willingness to participate. The results presented here will serve to open a reflection process for academics and practitioners about how the different CI activities (within the CI system) are being designed, especially given that their intention should be to get the highest possible degree of participation but no quantitative feedback is being received about people's satisfaction about the system.

5 CIAM MODEL

Understanding which are the main organizational determinants of employee participation in CI

5.1 INTRODUCTION

Based on an exhaustive literature review and a three-round Delphi panel study with 21 CI experts from Spain, this step of the thesis aims to identify a set of critical elements that are relevant for promoting employees' intention to participate in the CI activities set by their company. Through this structured discussion with academics and practitioners, 44 elements clustered into 10 factors related to the necessary elements to motivate employees to participate in CI systems was obtained. These factors, together with four other factors adapted from the TAM model literature, were structured into a comprehensive theoretical model to understand the main organizational determinants of employee participation in CI. In terms of implications, this common ground between academics, consultants and practitioners served as a basis for future empirical work on the main elements that managers should take into consideration when trying to improve employees' intention to participate in the CI system.

5.2 METHODOLOGY

The main objective of this section is to identify a set of critical elements that are relevant for boosting employees' intention to participate in the CI activities set by their company. It also seeks a structural model that shows the relationship between these elements. To address these objectives, a three-phase research methodology was developed:

Phase I A literature review aimed at identifying the critical enablers of success in CI systems, and their possible relationship with employees' intention to participate.

Phase II A three-round Delphi study was conducted with experts including academics, consultants and practitioners in Spain. The objective was to have experts identify, refine and reach a consensus about all the relevant elements necessary for boosting employees' intention to participate in the CI system.

PhaseIII An interpretive structural modelling (ISM) approach was employed to develop the structural relationship between the final list of factors obtained from Phase II.

5.2.1 PHASE I: LITERATURE REVIEW

First, a general review was made with the main objectives of identifying major issues and concerns regarding the success of CI systems, as well as identifying a series of relevant elements related to employee intention to participate in CI. This information was used to construct the initial documents for the Delphi Study. To conduct the literature review it is important to obtain the primary information from reliable resources. The review was made using Thomson Reuters Web of Science™ (WoS) database, one of the most prestigious and internationally well-known research platforms available. The first search criteria used was that only scientific articles from 1980 to 2015 were included. Then, in terms of the topic, the search was limited to the following key words in the theme: "continuous improvement", "employee involvement", "employee participation", "success factors" and "enablers". A more detailed explanation of the search process is shown in Figure 15.

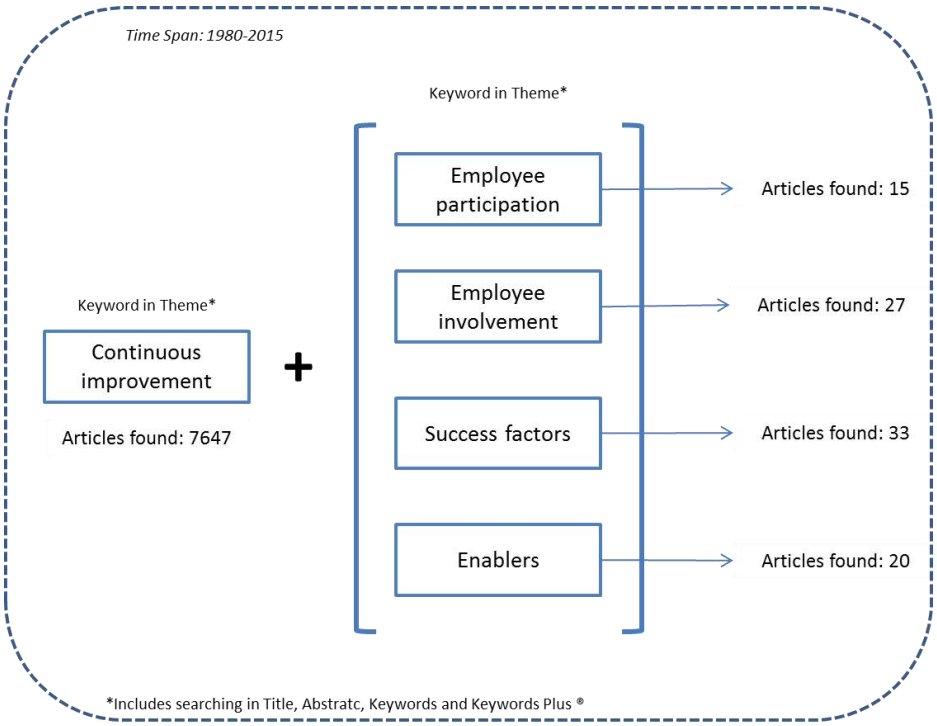

Figure 15 - Literature review search process

5.2.2 PHASE II: DELPHI STUDY

A three-round Delphi Study was conducted with a group of experts in CI application in Spain from October to December 2014, with the objective of constructing and agreeing upon a list of all the relevant elements of CI systems that could motivate employees to participate in CI activities.

All discussions during the Delphi study were in Spanish. This was done to make sure that the final list of factors and elements had both semantic and conceptual validity for the population in which the research was carried out (Arribas 2006; Serra-sutton et al. 2002). However, for the purpose of this thesis and to ensure validity for English-speaking countries, relevant results were translated into English by a professional translator.

As seen in Chapter 3, four distinct characteristics usually remain the same in all Delphi studies: *anonymity*, *iteration*, *controlled feedback*, *statistical group response*. During our research, anonymity was ensured by having participants only interact

directly with a moderator who was in charge of analysing all responses and sending the feedback and instructions. This helped participants to respond more freely and sincerely, allowing for more successful research (Landeta 2006). Iteration was achieved through a series of rounds—three in this specific case—in which participants' answers were summarized by the moderator and provided as feedback for the next round. This was done until stability in the answers (and not necessarily consensus) was obtained (Linstone & Turoff 2011). Controlled feedback consisted of the moderator filtering the information given to all participants, trying to eliminate all irrelevant information or noise from the discussion (Landeta 2006). Finally, the statistical response during each round was shown to all participants in the form of graphs, showing measures of central tendency (means) and frequency distributions (Von der Gracht 2012). This helped participants to decide whether to change their previous answers or stay with their initial decisions.

5.2.2.1 PARTICIPANT AND PANEL SELECTION

Following the multi-step procedure based on Okoli and Pawlowski (2004), the list of experts was constructed (the details of the process were explained in Chapter 3).

To create a list of possible candidates to participate in the Delphi panel, a second literature review was conducted. Once again, WoS was selected as the reference database for relevant academic research. In this case, only scientific articles covering the time period from 2000 to 2014 were included, to ensure that the resultant experts had relevant and current contributions. Moreover, to ensure a list of Spanish experts, the search was limited to the keywords "Spain" or "España" in the authors' addresses. Finally, in order to obtain a list of possible CI experts, the search was limited to the following keywords in the theme: "kaizen" or "continuous improvement" or "improvement methodology" or "six sigma" or "theory of constrains" or "lean manufacturing" or "lean thinking" or "Toyota production system" or "total quality management" or "just in time" or "organizational excellence" or "business excellence" or "quality management systems", and other variations of these terms. The result from this search

obtained 474 articles, from which 141 were finally included in the list after all papers were manually revised to check that they were no duplicates and that they were truly related with the topic. All this 141 articles were used to construct a list with all Spanish authors. To select appropriate candidates, in the case of academic experts, a criterion of at least two articles about topics related to the CI body of knowledge in peer reviewed journals found in the WoS database in the last fifteen years was used as a minimum standard of expertise.

In addition, a thorough review of relevant material found on the Internet was conducted to identify practitioners and consultants who were active in the study and reporting of issues related to CI applications and to identify companies considered to be at the leading edge of CI practice. In the case of consultants and practitioners, the criterion was based on the relevant information found in the Internet combined with the expertise of the research team.

After the invitation process was completed, 21 experts agreed to participate in the Delphi study (11 academics, 4 consultants and 6 practitioners). The resultant 11 academics (from 10 different Universities throughout Spain) had between 2 and 10 relevant articles each, all in the WoS and in the last 15 years. The 4 consultants are all senior consultants with recognized experience in CI in the Spanish industrial sector. The 6 practitioners are one General Manager, three Industrial Managers, one CI Manager and one Lean Manager; also four of the companies are multinational companies and two are national-based companies with international projection.

Although some researchers tend to conform different panels for academics and practitioners, in this case, and based on the objectives of the project, the research team agreed that it was best to have academics and practitioners all together in one Panel. The main reason was that the intention of the research was to get a consensus upon a list that reflected some of the main challenges faced by practitioners, but also reflect some of the main challenges considered by academics. The best way to reflect both of these visions within one single list was to allow both groups to discuss all together within one single Panel. This mix allowed confronting all the ideas from both academics and practitioners,

helping to create a more solid single list of elements affecting employee participation in CI.

5.2.2.2 DELPHI STUDY PROCESS

As mentioned above, the objective of the Delphi study was to reach a consensus on a list of elements relevant to CI systems that could motivate employees to participate in those same systems. All three rounds of the Delphi process consisted of a controlled discussion about which factors and elements were most relevant and should be included on this list.

After receiving all 21 experts' written consent to participate in the Delphi study, the first questionnaire (round 1) was sent out. To accelerate the consensus process and to ensure better quality in the final list of elements obtained from the process, an initial set of elements was developed by the research team based on the literature review. Some of the elements correspond to the literature on CI enablers, while others correspond, following Tang et al. (2010), to factors associated with behavioural theories such as TRA, TPB and TAM. The idea was to provide an initial set of individual- and organizational-level elements that may provide a means of identifying the forces that drive employees' intention to participate.

In total, 45 different elements were included, grouped into 10 different factors: CI alignment (Bessant et al., 2001), Recognition and rewards (Macey & Schneider 2008), Internal communication (Lloria & Moreno-Luzon 2014), Organizational Support (Bessant et al. 2001), Training (Amoako-Gyampah & Salam 2004), Improvement Methodology (Corso et al. 2007), Job Satisfaction (Dahlgaard-Park 2012), Social influence (Fishbein & Ajzen 2010; Tang et al. 2010), Self-efficacy (Venkatesh 2000; Tang et al. 2010), Empowerment (Tang et al. 2010).

In this first round, for each of the 10 factors, participants were instructed to do four things: i) Suggest elements to eliminate; ii) Suggest new elements to add; iii) Evaluate whether all relevant elements within the factors were adequately covered, using a 7 point Likert-scale, where 1 is totally disagree and 7 is totally

agree; iv) Give arguments, if necessary, for all their answers in i), ii), and iii). Moreover, the experts were asked to suggest the addition of new factors and elements, and they had the space to make other comments regarding the study.

Then, for Round 2, a new questionnaire was created based on all the experts' eliminations, additions, scores and comments from Round 1. This new questionnaire, together with a feedback document containing all participant scores for task iii) and the most relevant arguments in favour of or against proposed changes was returned to all participants for a second evaluation. Once again, all participants were asked to review the new list of factors and elements, and were instructed to do activities i), ii), iii) and iv).

After looking at results from Round 2 and after comparing them with the ones obtained in the previous round using paired t-tests, it was concluded that there was already enough consensus. So in Round 3, experts were given back the improved list of elements based on the comments from Round 2, and they were asked to make some final comments about the elements, factors and their definitions.

5.2.3 PHASE III: ISM APPROACH

The ISM technique was used to develop a model that structures the relationships of all the factors encountered during the Delphi and three factors called 'Employees' intention to participate', 'Usefulness of participating in the CI system' and 'Ease of participating in the CI system'. These last two factors were adapted from the TAM model and were introduced following the reasoning of Tang et al. (2010) work, in which the nature of employee participation in CI activities (requiring the mastering and use of many CI tools) could be seen as similar to the nature of employees using computer programs to improve their daily work. Therefore, factors similar to the ones used in the TAM model to relate a set of system design characteristics with behavioural intention to use the system could be applied to the CI case.

5.3 DELPHI STUDY RESULTS

As mentioned before, the Delphi study was conducted for three rounds. In the first round, participants scored all initial 10 factors, and decided upon possible eliminations, inclusions and comments. After analysing the results, the research team found that no extra factor was needed to take into account all participants' comments and recommended inclusions, but there were some factors that needed to be re-named to better reflect some of the relevant elements of the CI systems. Therefore, the second version of the list, used for Round 2, had the same amount of factors and only differed in the amount and type of elements and in the names of some of the factors. The second round questionnaire, also contained the scores of each of the experts in a way that they could re-evaluate their decision in terms of the rest of the expert's scores and comments. As an example of this, Figure 16 shows the scores for one of the factors, in which individual scores for each of the expert are shown in the form of a bar chart (each expert received a similar bar chart but with their score highlighted in a different colour).

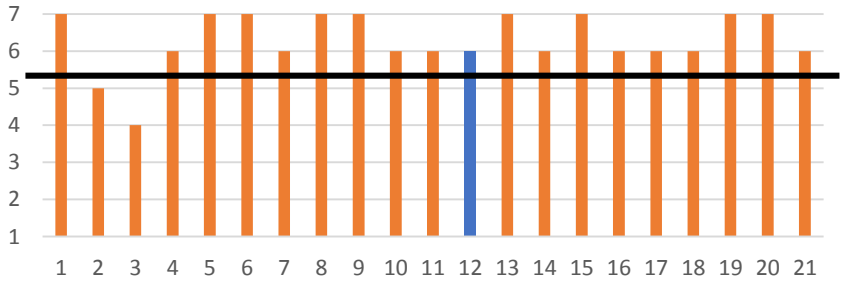

Figure 16 – Experts' scores for Social influence factor Round 2

The overall scores for each of the factors are shown in Table 16. In order to verify that the results from Round 2 were better than the results from Round 1 (meaning a higher degree of agreement among participants), paired t-tests were used. The discussion about the factors and elements was closed after Round 2 (although Round 3 was allowed for final comments and closure), since no extra factor was suggested by participants. The paired t-test showed significant improvement between Rounds 1 and 2, and all mean scores were above 6 out of 7. In addition, Table 16 also shows the evolution in the amount of elements

constituting each factor from Round 1 to Round 2. After all three rounds, 44 elements grouped into 10 factors were identified by the experts as being important for motivating employees to participate in CI activities (Figure 17).

Table 16 - Delphi results: score to assess the completeness of all included relevant factors

	Round 1			Round 2			
Relevant Factors	# Elements	Mean	Stdev	# Elements	Mean	Stdev	95% Upper bound for mean D
CI alignment	4	5,31	1,2	5	6,05	0,78	-0,26**
Recognition & rewards	4	5,21	1,44	4	6,05	0,97	-0,34**
Communication	4	5,63	1,21	4	6,42	0,61	-0,38**
Organizational Support	5	5,05	1,31	4	6,21	0,63	-0,61**
Training	4	5,58	1,39	4	6,47	0,51	-0,44**
CI Methodology	4	5,05	1,31	4	6,32	0,58	-0,75**
Job Satisfaction	7	5,95	1,12	7	6,42	0,69	-0,17**
Social Influence	5	5,28	1,23	4	6,39	0,61	-0,72**
Self-Efficacy	4	5,74	1,05	4	6,42	0,69	-0,29**
Empowerment	4	5,95	1,18	4	6,26	0,73	-0,04*

*p-value < 0.1; **p-value < 0.05

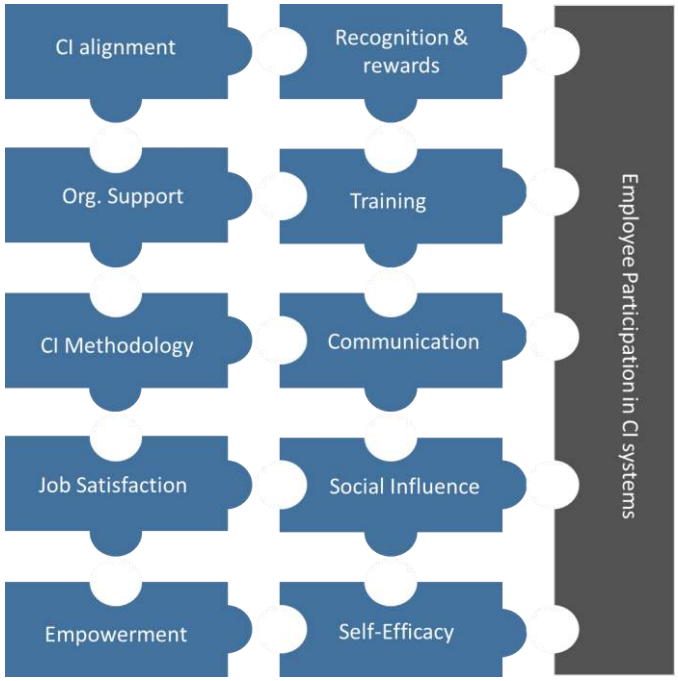

Figure 17 - Final model agreed by the experts

In general, experts were very positive about most of the elements included in the initial proposal of the questionnaire, mentioning that they were all important elements that determined the success or failure of CI systems. During the course of the three rounds, experts helped simplify and clarify many of the concepts included in the initial list, helped eliminate redundancies among factors, and offered some new and interesting insights about missing elements based on their academic and professional experience. Table 17 shows the list of final factors (with their definitions) and elements agreed on by the experts as being important for promoting employee intention to participate in CI activities (for a full description of each element see Appendix A).

Table 17 - Final list of factors and elements

Factor	Definition	Elements
1. CI alignment	This factor deals with the definition, dissemination and understanding of group and individual-level goals, objectives and tasks assigned by the organization in terms of CI related activities.	Objectives
		Shared Vision
		Coherence
		Responsibility
		Participation
2. Recognition & rewards	This factor addresses the expectations that people have about the results achieved within the CI system, and how they consider, in the case they exist, that the different reward systems set by the organization (economic and non-economic) could motivate employees' intention to participate in future CI activities.	Attractiveness
		Effort efficacy
		Fair Rewards
		Motivation
3. Internal Communication	This factor searches for the existence of good vertical (top-down, bottom-up) and lateral (employee-employee) communication of CI related information, and not so much about what specific tools are used for that.	Involvement
		Information
		Knowledge sharing
		Channels
4. Organizational Support	This factor talks about CI leadership inside the organization, and about the organizational support given by top management to develop all improvement activities.	Resources
		Management involvement
		Leadership
		Support network
5. Training	This factor includes all training activities that help to teach employees notions, tools and techniques that are useful for participating in the different CI activities promoted by the company.	Knowledge
		Awareness
		Capabilities
		Usefulness
6. CI Methodology	This factor refers to the extent to which the different practices, techniques and tools (included within the company's CI system) allow for the achievement of good results.	Tools
		Dynamic
		Sustainability
		Routines
7. Self-Efficacy	This factor reflects each worker's self-confidence level in terms of participating in CI activities, based on a self-assessment of his/her own capabilities.	Autonomy
		Assistance
		Documentation
		Time Availability

8. Empowerment	This factor refers to the amount of actual opportunities that top management give workers to actively participate in the CI system.	Participation
		Leading Opportunities
		Decision-making
		Opinions seeking
9. Social Influence	This factor reflects the potential positive or negative social influences that workers receive from closely-related people (family, friends, co-workers, bosses, etc.)	Supervisor
		Co-worker
		Coaches
		Environment
10. Job Satisfaction	This factor includes the most important aspects that affect each worker's personal satisfaction level at his/her workplace.	Climate
		Trust
		Work Organization
		Process owner
		Workplace
		Contract terms
		Personal growth

5.3.1 EXPERTS' COMMENTS

Apart from the scores, during the whole Delphi Panel experts made some very interesting comments about the different elements and factors, and why they were so important for the success of CI systems. Below, some of the most relevant participants' comments about some of the elements within each factor are provided.

CI alignment: Some academics commented, "in order to achieve top-down alignment, it is necessary that employees believe their CI related objectives to be attainable". Another academic said, "it is necessary that employees know these objectives, and think they are both clear and adequate given the reality of the company". Furthermore, one practitioner said, "the best way to embrace CI objectives is if they affect me directly, my personal development and my recognition inside the organization". In this sense, he added, "it is important that all objectives (and its fulfilment) are mutually revised and agreed (looking for

support and continuous improvement and not a mere critique) as a way of aligning efforts and promoting leaders". Finally, another practitioner argued, "employees should not feel like CI is an extra burden demanding mental strain, but rather as a daily activity that helps them achieve their personal and organizational goals".

Recognition and rewards: One academic argued, "it is important to see whether employees feel that their own efforts towards CI will be rewarded in an attractive way". Meanwhile, one practitioner pointed out the importance of "giving public recognition to employees that successfully participate in the CI system, as a way of strengthening employees' moral and personal status inside the organization". He also said that "while in Japan employees are used to being publicly acknowledged (for example with posters in the cafeteria walls) for their efforts towards CI, here in Europe people tend to be more jealous about publicly showing this kind of recognition". He ends by stating, "With time, European employees will start to understand the benefits and pride of being publicly acknowledged for being change agents whatever the method used".

Internal Communication: One academic stated, "it is important for employees to be aware about any organizational information that they feel could affect their personal and professional well-being". One consultant added that "it is important that employees receive the information they feel is needed, and not only the information that top management feels is needed". One practitioner pointed out that "in order to have engaged employees, it is important that they feel they can express their own ideas and thought about possible improvement projects in an open and effective way".

Organizational Support: One academic said, "it is better if CI is integrated into everyone's work, having all middle and top managers responsible for this. CI cannot be delegated into a group of people, but each manager should be responsible for CI in its own working area". One consultant added, "Only if each manager commits to promote and do the follow-up of CI in its area, people will understand and see that it is a top priority for the company and will engage into participating". Another practitioner said, "It is important that top management

gives momentum to the CI system, showing that activities within the CI system are a priority, especially given that company's resources are limited".

Training: One academic said, "I believe training to be particularly vital for top and middle management, which should then take the responsibility of training their subordinates, as a way of cascading knowledge". One consultant added, "The best way of training to participate in the CI system is learning by doing, and therefore, everybody should be involved in the learning process". In addition, most experts agreed on the importance of asking about the development of competencies and not just about learning some techniques.

CI Methodology: One consultant said, "A good methodology allows for the identification of certain routines which enables the establishment of new working habits in areas of priority for the company". The same consultant argued that "it is important to know what employees think about all the different tools and techniques used within the CI system, as it is from this exchange of opinions and experiences that the company can advance towards creating its own CI methodology in order to achieve continuous improvement". Another consultant stated, "The methodology used is essential to the success of the CI, as it helps all employees to feel safe and confident about what they are doing". Finally, in terms of the characteristics of the methodologies, one practitioner talked about the importance of employees perceiving CI methodology as "agile, dynamic and effective to achieve the pre-set goals".

Job Satisfaction: One academic referred to the importance of "employees feeling satisfied with the way the daily work was organized (tasks, responsibilities, roles)". One practitioner mentioned the importance of "employees feeling part of the company as an important element". Moreover, some academics and practitioners mentioned the importance of employees' satisfaction towards workplace health and safety related issues, as well as working conditions issues such as job security, salary and working schedules. Finally, one practitioner argued about the importance of including employees' feelings by saying, "their daily work was challenging and contributed to their personal and professional growth".

Social Influence: One academic stated, "it is important to take into account whether the people that help employees with taking decisions and actions influence him/her to participate in CI activities". Furthermore, other academics brought to attention the possible importance of unions as an influence to employees' decisions on participating in CI activities. One expert added, "unions had a big effect into employer-employee relationships and that even if the employee is not affiliated, it did affect him through what other unionized co-workers think about it".

Self-Efficacy: Both, practitioners and academics mentioned the importance of "making employees capable of completing CI activities by teaching them to rely first on another co-worker to find the solution, and then if the problem was too big, to escalate it to their superiors". One practitioner talked about the importance of "allowing employees with enough time so that they feel confident about completing the assigned tasks".

Empowerment: One academic argued about the importance of "employees feeling they had real opportunities to participate into decision-making and not only opportunities to participate in the implementation of the CI activities". One consultant expressed that he considered "empowerment to be capital to the success of CI system, understanding that one of the most important challenges facing CI system is achieving its sustainability over time after the initial kick-off". He argued, "typically, companies hire consultants to help with the kick-off, but then, the only way by which companies can really continue implementing successful CI systems is if they empower their employees to do these tasks".

5.4 ISM RESULTS

This section's objective is to develop a theoretical relationship model that accounts for the organizational factors that motivate employees to participate in CI activities. In order to do this, we sought to transfer many of the ideas validated in the TAM model and its subsequent variations, adapting them to the case of CI. Furthermore, our proposed model tries to explain and predict many of the adapted TAM variables by incorporating many of the CI enablers commonly found in the literature and discussed during the Delphi study.

5.4.1 DEFINE ELEMENTS

The first step consisted of defining, based on the literature review and the results of the Delphi study, the final list of variables and relationships (hypotheses) that needed to be included in the model. Most of the factors included in the analysis come from the Delphi panel explained previously. The only extra factors added are the one conforming the modified TAM model for the case of CI: Perceived usefulness of participating in CI activities, Perceived ease of participating in CI activities, behavioural intention to participate in CI activities, and actual participation in CI activities (as the dependent variable). In addition, we used already existing relationships found in related literature as much as possible. The rest of the relationships, which was one of the main things we were looking forward with this technique, were hypothesised based on the experts' own judgements.

5.4.1.1 RELATIONSHIPS FOUND IN LITERATURE

Based on the aforementioned TAM model and its variations (see Chapter 2), the objective of the theoretical model is to show how to adapt the TAM model to the case of employee participation in CI activities. In this study, *employee participation in CI* is the actual behaviour we aim to predict. In particular, from all the possible activities involved in a CI system, two different ways of participating were chosen for study: participating in improvement projects or teams and participating in the suggestion system, since they are the most important forms of participation in CI. With this in mind, it could be argued that the same reasoning used by Davis (1989) could be applied, and that this actual participation could be predicted by an intention, which in turn, could be predicted or explained in terms of certain beliefs about participating in the CI system.

Furthermore, based on Tang et al. (2010), certain analogies can be drawn between the use of technology and participation in the CI system. For example, the use of technology means that employees have accepted the use of some specific tools. Engaging employees in participating in CI activities implies a change in their mind-sets and in the company's working culture, which usually

occurs through learning and internalizing a whole new set of procedures, techniques, and behaviours. Yet it could be argued that, at the end of the day, employee participation in each of the different CI activities could be interpreted as employees needing to master and use a given set of CI tools and techniques (whether they are technological or not). Therefore, in terms of daily use or implementation, both cases could be narrowed to whether an employee accepts or rejects a given set of tools and techniques. Given these assumptions, it is possible to suggest that the same beliefs affecting the use of technological tools could affect the use of certain CI tools and techniques. Based on this reasoning, the following hypothesis will be tested in the model:

H1) Perceived usefulness of participating in CI activities has a positive impact on behavioural intention to participate in CI activities

H2) Perceived ease of participating in CI activities has a positive impact on behavioural intention to participate in CI activities

H3) Perceived ease of participating in CI activities has a positive impact on perceived usefulness

H4) Behavioural intention to participate in CI activities has a positive impact on actual participation in CI activities

In addition, some of the adjustments and anchors presented by Venkatesh (2000), Venkatesh and Davis (2000) and Venkatesh and Bala (2008) were included to extend the TAM model. Specifically, the variables included in this study were social influence and self-efficacy, and they too were adapted to the case of CI. Both of these constructs were also acknowledged by Tang et al. (2010) as being very important determinants of employees' intention to participate in CI activities related to quality management.

In particular, Tang et al. (2010) argued that self-efficacy (sometimes termed self-confidence) is important for successful involvement in TQM practices such as detecting quality problems and generating innovative and useful ideas to solve them. Moreover, they express that people with high self-confidence allows them to see difficult tasks as challenges rather than threats, and therefore stimulates their involvement in such activities. Shea and Howell (1998) agree, proposing

that employees' self-efficacy and outcome expectancy determine employees' behaviours related to TQM. Finally, Yeh (2003) claimed that employees' self-efficacy should influence employees' continuous quality improvement activities. On the other hand, the variable of social influence refers to the social pressure that an individual is subject to in order to perform or not perform a certain target behaviour (Fishbein and Ajzen, 2010). In terms of CI, Tang et al. (2010) argued that a supportive social environment should be a very important pillar in TQM systems, as it is likely to encourage employees to be more involved in these kinds of activities. Yeh (2003) also found a relationship between interpersonal support within an organization and employee participation in TQM activities.

In the case of our study, self-efficacy refers to the degree to which employees believe themselves capable of participating in the different CI activities, while social influence refers to the degree to which employees perceive that important others (supervisors, colleagues, others) believe they should participate in the CI system. Based on the relationships found in TAM's extension models and the aforementioned arguments, the following hypotheses were added:

H5) Social influence has a positive impact on perceived usefulness

H6) Self-efficacy has a positive impact on perceived ease of participation

Furthermore, according to Tang et al. (2010), perceived behavioural control, understood as the belief as to how easy or difficult to perform the target behaviour is likely to be, is also an important determinant of participation in CI. In particular, one of the components of perceived behavioural control can be associated with self-efficacy (already explained), while another important part of it involves employees' perceptions about the presence or absence of sufficient resources and opportunities necessary to perform the intended behaviour, many times regarded as empowerment. Employee empowerment exists when employees feel they can exert some control over their work. Tang et al. (2010) claim that employee empowerment has been used as an effective management strategy to involve employees in their jobs to a greater extent and to have them participate in the decision-making activities related to quality improvement. In Tang et al (2010) article, there is also evidence that empowerment (through

increased awareness of responsibility) can lead to increased employee participation. There is also evidence that employees' feeling of empowerment has a positive relationship with perceptions of employee involvement success (Daily & Bishop 2003, cited in Tang et al. 2010). Based on the aforementioned arguments, the following hypothesis was added:

H7) Empowerment has a positive impact on employees' participation in CI

Finally, there is also enough evidence to support a possible positive link between employee satisfaction at work and their engagement or commitment. For instance, Salanova et al. (2011) showed that work engagement is associated with all kinds of positive emotions, including enthusiasm, comfort, and satisfaction. Moreover, Tietjen and Myers (1998) argue that achieving satisfaction within workers is a crucial task of management, since satisfaction creates confidence, loyalty and ultimately improved quality in the output of the employed. Hsu and Wang (Hsu & Wang 2008) express the idea that employees who are satisfied with their jobs are likely to be more committed to the organization and more productive. In fact, de Menezes (2012) clearly suggests a strong positive correlation between the levels of job satisfaction and organizational commitment in the workplaces, as well as significant relationship between job satisfaction and other desired outcomes (positive relationship with productivity and quality plus a negative effect on absenteeism). These results show that job satisfaction is not only important in its own right, but may also influence the links between quality management strategies and performance or other desired employee outcomes (de Menezes 2012). In fact, Dahlgaard Park (2012) found through a survey to Danish companies that the six most important factors in relation with job satisfaction are: personal development, recognition and self-respect, meaningful work, a good physical working environment, salary and job security. They also found positive correlation between many of these elements (grouped inside a factor called core values) and employee commitment. Furthermore, in connection with achieving employees' job satisfaction, many authors have argued a positive relationship between process improvements and incentives (Bateman & Rich 2003; Bhuiyan & Baghel 2005; Spackman 2009), with some even suggesting that companies should offer rewards in order to

motivate employees to develop creative activities (Jiménez-Jiménez & Sanz-Valle, 2008). Therefore, given these apparently close connection between job satisfaction, rewards, and employee commitment and motivation, the following hypotheses were proposed:

H8) Job satisfaction has a positive impact on employees' participation in CI

H9) CI recognition and rewards have a positive impact on job satisfaction

H10) CI recognition and rewards have a positive impact on employees' participation in CI

Table 18 summarize the relationships being included from the literature.

Table 18 - Relationships from literature

Factors	SE	E	SI	JS	EP	U	IP	P
Self-Efficacy (SE)	1	0	0	0	1	0	0	0
Empowerment (E)	0	1	0	0	0	0	0	1
Social Influence (SI)	0	0	1	0	0	1	0	0
Job Satisfaction (JS)	0	0	0	1	0	0	0	1
CI recognitions and rewards (I)	0	0	0	1	0	0	0	1
Perceived Ease of participation (EP)	0	0	0	0	1	1	1	0
Perceived Usefulness (U)	0	0	0	0	0	1	1	0
Behavioural Intention to participate (IP)	0	0	0	0	0	0	1	1
Employee Participation in CI (P)	0	0	0	0	0	0	0	1

5.4.1.2 OTHER RELATIONSHIPS

Without considering the factors used to construct the aforementioned hypotheses, the following factors found during the Delphi remain without any connection to the model:

Organizational support, Training, CI methodology, Communication, and CI alignment.

Experts participating in the Delphi study helped to construct the possible theoretical model that would be tested, by revising the hypotheses expressed in the previous section and by expressing their point of view about these remaining

factors. To do this, all 21 experts from the Delphi study were asked to use their expert judgment to express their own views about the possible relationships between the remaining factors and the factors appearing in Table 18. In order to simplify the model, no relationships were considered between the six remaining CI factors. Also, in order to simplify the expert's decisions on the relationships, they were only asked to relate the CI enablers with employee's intention to participate (and not to distinguish between employee's intention to participate and employee participation).

To achieve this, each expert was given a matrix containing the different factors included in the study both in the rows and in the columns (each cell representing a possible relationship between factors). Some of the cells in this matrix were already filled by the research team, based on the aforementioned hypotheses found in the literature. Nevertheless, experts were asked to revise these pre-established relationships, and were allowed to submit their comments about them. They were also instructed to fill the remaining of the table and make any relevant comment about them. To do this, experts had to rate each possible relationship as follows:

- 0 - No relationship
- 1 – Weak relationship
- 2 – Moderate relationship
- 3 – Strong relationship

After having all the experts' relationship matrixes, all data was gathered into one single file. To reach a unified solution to this matrix, a criteria of an average response over or equal to 2 was considered as a valid result to include the relationship in the model (for example, if the average of all experts' scores in the cell related to the relationship between communication and perceived usefulness is above or equal to 2, this relationship is included in the final model). The average scores are shown in Table 19.

Table 19 - Average scores based on experts opinions

Factors	SE	E	SI	JS	EP	U	IP
CI Alignment	1,4	1,7	0,8	1,7	0,9	2,8	1,8
Communication	1,9	1,9	1,7	2,2	1,6	2,0	2,1
Organizational Support	2,1	2,5	1,4	2,1	1,8	1,9	2,4
Training	2,7	2,4	1,0	2,2	2,6	1,8	1,7
CI Methodology	1,9	1,6	0,5	1,4	2,2	2,0	1,3

Based on these scores, the following hypotheses were obtained:

H11) Organizational support has a positive impact on employees' intention to participate in CI

H12) Organizational support has a positive impact on empowerment

H13) Organizational support has a positive impact on self-efficacy

H14) Organizational support has a positive impact on job satisfaction

H15) Training has a positive impact on empowerment

H16) Training has a positive impact on self-efficacy

H17) Training has a positive impact on ease of participation in CI

H18) Training has a positive impact on job satisfaction

H19) CI methodology has a positive impact on usefulness of the CI system

H20) CI methodology has a positive impact on ease of participating in CI

H21) Communication has a positive impact on usefulness of the CI system

H22) Communication has a positive impact on job satisfaction

H23) CI alignment has a positive impact on usefulness of the CI system

5.4.2 REACHABILITY MATRIX (RM)

Once the structural self-interaction matrix (SSIM) was developed, it was transformed into a RM format by transforming each SSIM entry into 1s and 0s. Both, the SSIM and the RM were constructed following the rules presented in Singh et al. (2007).

Once the initial reachability matrix was constructed, the matrix was checked for transitivity (meaning 1s were added to fill the gap in the opinion collected during the SSIM). The final RM is shown in Table 20.

Table 20 - Final reachability matrix

Factors	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 CI alignment	1	0	0	0	0	0	0	0	0	0	0	1	1	1
2 Recognition & rewards		1	0	0	0	0	0	0	0	1	0	0	0	1
3 Communication			1	0	0	0	0	0	0	1	0	1	1	1
4 Org. Support				1	0	0	1	1	0	1	1	1	1	1
5 Training					1	0	1	1	0	1	1	1	1	1
6 CI Methodology						1	0	0	0	0	1	1	1	1
7 Self-efficacy							1	0	0	0	1	1	1	1
8 Empowerment								1	0	0	0	0	0	1
9 Social Influence									1	0	0	1	1	1
10 Job Satisfaction										1	0	0	0	1
11 Perceived Ease of participation											1	1	1	1
12 Perceived Usefulness												1	1	1
13 Employee intention to participate													1	1
14 Employee participation														1

5.4.3 PARTITIONING THE REACHABILITY MATRIX

The reachability matrix is partitioned based on the reachability and antecedent sets for each factor. A reachability set consists of the factor itself and the other factors that it may help achieve. The antecedent set consists of the factor itself and the other factors that may help it be achieved. The intersection of these two sets is calculated for all factors. Then, the top element in the ISM hierarchy (the one that does not help achieve any other element above its own

level) is found based on which factor has the same set of factors for the intersection set and the reachability set. Once this factor is found, it is removed from the list of factors. Then, the same process is repeated to find the elements in the next level. This is done until all factors are assigned to a level. For this case, the 14 factors, their reachability set, antecedent set and intersection set are shown in Table 21 (iteration 1). Iteration 2 to 6 are shown in Tables 22 to 26. The resulting levels can be derived from these tables following the aforementioned instructions. Table 27 shows the final level for each of the factors as well as their driving power (the sum of the rows in the final reachability matrix) and dependence (the sum of the columns in the final reachability matrix).

Table 21 - Partitioning - Iteration 1

Factor	Reachability set	Antecedent set	Intersection set	Level
1	1,12,13,14	1	1	
2	2,10,14	2	2	
3	3,10,12,13,14	3	3	
4	4,7,8,10,11,12,13,14	4	4	
5	5,7,8,10,11,12,13,14	5	5	
6	6,11,12,13,14	6	6	
7	7,11,12,13,14	4,5,7	7	
8	8,14	4,5,8	8	
9	9,12,13,14	9	9	
10	10,14	2,3,4,5,10	10	
11	11,12,13,14	5,6,7,11	11	
12	12,13,14	1,3,4,5,6,7,9,11,12	12	
13	13,14	1,3,4,5,6,7,9,11,12,13	13	
14	14	1,2,3,4,5,6,7,8,9,10,11,12,13,14	14	1

Table 22 - Partitioning - Iteration 2

Factor	Reachability set	Antecedent set	Intersection set	Level
1	1,12,13	1	1	
2	2,10	2	2	
3	3,10,12,13	3	3	
4	4,7,8,10,11,12,13	4	4	
5	5,7,8,10,11,12,13	5	5	
6	6,11,12,13	6	6	
7	7,11,12,13	4,5,7	7	
8	8	4,5,8	8	2
9	9,12,13	9	9	
10	10	2,3,4,5,10	10	2
11	11,12,13	5,6,7,11	11	
12	12,13	1,3,4,5,6,7,9,11,12	12	
13	13	1,3,4,5,6,7,9,11,12,13	13	2

Table 23 - Partitioning - Iteration 3

Factor	Reachability set	Antecedent set	Intersection set	Level
1	1,12	1	1	
2	2	2	2	3
3	3,12	3	3	
4	4,7,11,12	4	4	
5	5,7,11,12	5	5	
6	6,11,12	6	6	
7	7,11,12	4,5,7	7	
9	9,12	9	9	
11	11,12	5,6,7,11	11	
12	12	1,3,4,5,6,7,9,11,12	12	3

Table 24 - Partitioning - Iteration 4

Factor	Reachability set	Antecedent set	Intersection set	Level
1	1	1	1	4
3	3	3	3	4
4	4,7,11	4	4	
5	5,7,11	5	5	
6	6,11	6	6	
7	7,11	4,5,7	7	
9	9	9	9	4
11	11	5,6,7,11	11	4

Table 25 - Partitioning - Iteration 5

Factor	Reachability set	Antecedent set	Intersection set	Level
4	4,7	4	4	
5	5,7	5	5	
6	6	6	6	5
7	7	4,5,7	7	5

Table 26 - Partitioning – Iteration 6

Factor	Reachability set	Antecedent set	Intersection set	Level
4	4	4	4	6
5	5	5	5	6

Table 27 - Factors, levels, driving power and dependence

Factor	Level	Driver	Dependence
14	1	1	14
13	2	2	10
8	2	2	3
10	2	2	5
12	3	3	9
2	3	3	1
1	4	4	1
3	4	5	1
9	4	4	1

11	4	4	5
6	5	5	1
7	5	5	3
4	6	8	1
5	6	8	1

5.4.4 DIGRAPH & ISM MODEL

On the basis of the reachability matrix and the partitioning into levels, an initial digraph was obtained (through nodes and lines of edges). After removing the indirect links and replacing nodes with factor names, the digraph is converted into the final ISM model (shown in Figure 18). The top-level factor is positioned at the top of the model, the second-level factors are in the second position, and so on. In this study, there were six different levels, with *Employees' participation in CI* being the most dependent factor, and *Training* and *Organizational Support*, being the factors with greatest driving power.

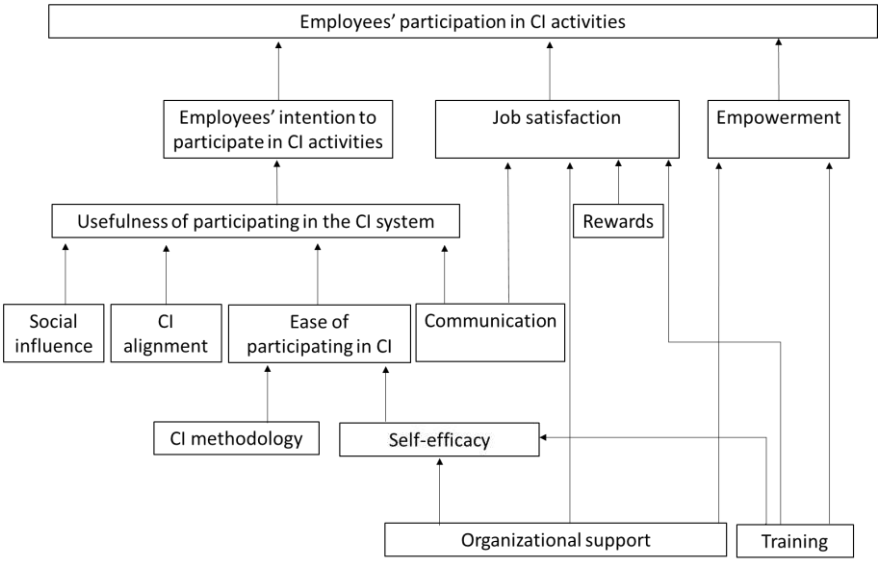

Figure 18 - ISM model for employees' intention to participate

5.5 FINAL CIAM THEORETICAL MODEL

After developing the corresponding digraph, we proceeded to add the transitivity links within the model. Having identified all 14 variables and 23 hypotheses, we finally constructed the theoretical continuous improvement acceptance model, CIAM, shown in Figure 19 (Arrows indicate direction of positive influence.). It is important to understand that the model presented in Figure 19 should be understand as a two-layer model. The first layer of the model (the inner or core model) consists of the adaptation of the TAM model to the case of CI, using hypotheses H1 to H6. Then, based on the CI experts' opinions, this inner model was enhanced in the second or outer layer by relating the set of CI enablers with the rest of the TAM variables, using hypotheses H7 to H23.

5.6 CONCLUSIONS AND IMPLICATIONS OF CIAM DEVELOPMENT

This study aimed to reach a consensus about the most relevant elements that should be taken into consideration when trying to improve employees' intention to participate in CI activities. By means of a structured discussion with academics and practitioners, this study was able to assess a relationship model, which according to these experts could help to explain what individual and organizational-level elements trigger employees' intention to participate in CI activities.

The first interesting result about the Delphi method itself was that academics, consultants and practitioners had a high degree of consensus from the beginning, which was reflected in the alignment of their comments and scores. This exercise of joining academics, consultants and practitioners is also interesting because it creates spaces for discussion between the academic and practical world, especially in a time where many professionals complain that more industry-university collaboration should be carried out in order to really advance along the path to excellence.

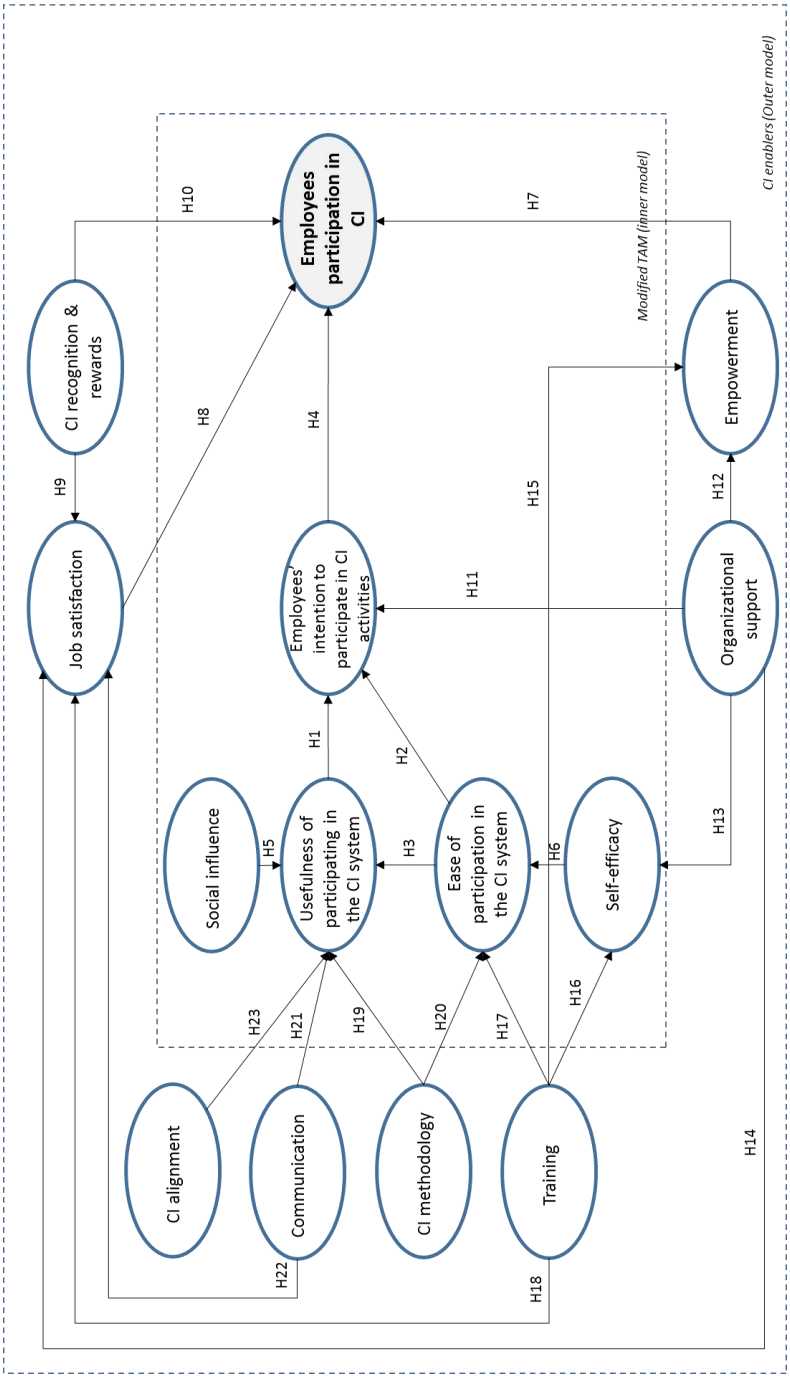

Figure 19 – Theoretical CIAM model.

In terms of the results obtained during the three rounds of the Delphi study, experts agreed on a list of 44 critical elements, clustered into 10 factors, that motivate employees to participate in the CI system. The fact that academics agreed with practitioners on a series of relevant elements encourages the academics to continue deepening the knowledge of these enablers, knowing that a solution to these obstacles will be welcomed by managers as the obstacles are nowadays regarded as real problems faced by real companies.

5.6.1 RELATIONSHIP MODEL

Experts were asked to discuss and propose possible relationships between the obtained list of factors and employee intention to participate. This discussion included the ten factors agreed upon during the Delphi process, two factors adapted from the TAM model, employees' intention and perceived participation. This 14-factor model was developed using the ISM approach, a well-established methodology for identifying relationships among specific items used to analyse problems and systems in various fields, as documented by Attri et al. (2013). Given the similarity of final model and the TAM model, the model presented in this chapter could be a first approach towards a continuous improvement acceptance model (CIAM). This model presents itself as the first attempt to integrate all organizational factors affecting peoples' intention to participate in CI activities inside a company.

In particular, it shows that Training and Organizational Support appear to be the factors with greater driving power, meaning that these should be some of the most important factors to look at when designing the CI systems. By working on strategies to improve training effectiveness and to show organizational support, employees will start to feel more capable to participate in CI activities, will feel more empowered to improve their workplace and will increase their job satisfaction. This sense of workplace well-being (self-efficacy, empowerment, job satisfaction together with good communication) contribute to have more committed and prepared employees willing to participate in CI activities. Similar findings have been shown in the work of Lam et al. (2015), in which the authors found that improving the workplace relationships (for example the quality of

supervisors-subordinate relationships) was correlated with employees' effectiveness when implementing CI activities.

Another interesting aspect of the model presented is the concept of usefulness of participating in the CI system and ease of participating in the CI system, and its direct relationship with employees' intention to participate. As with the TAM model, if employees fell that participation in the different CI activities is easy (meaning no extra effort) and is useful to improve the effectiveness of their daily work, they will be more supportive of these kind of activities. Evidence supporting these relationships can also be found in the work of Tang et al. (2010). Finally, the model also shows the influence and importance of other variables such as CI alignment, Social influence, Rewards and CI methodology. Evidence for the impact of social influence on employee involvement in quality improvement activities can be found in Tang et al. (2010). The model also supports the findings of Lok et al. (2005) that shown that strategic objectives alignment with your process improvement efforts, top management commitment, and employee empowerment amplifies the chances of achieving successful process change. Finally, the model also supports the arguments presented in Jaca et al. (2012) about the impact of rewards and the use of an appropriate methodology to develop CI activities and motivate people to commit to CI.

This relationship model represents a very important tool for managers, as it gives insights into where the limited resources that a company allocates to its CI system should go in order to have more engaged employees. In particular, the fact that this model contains many organizational-level variables (related to the CI system's characteristics and design), presents an advantage over other models depending exclusively on individual-level variables (such as Tang et al., 2010), since these variables are more easily managed by the company, allowing for better improvement opportunities.

5.6.2 PRACTICAL IMPLICATIONS

This study not only provides an important contribution to the operations management and CI literature, but there are also some clear practical implications as well. First, this study shows a list of specific behaviours and elements that can help to improve employee's participation in CI tasks. Increasing managers' awareness and usage of these elements, may increase the success rate of CI systems while improving employees' working relationships. Furthermore, the list of relevant elements agreed on can serve to construct a questionnaire to assess the current situation of this issue in companies already implementing CI systems, serving also as a management tool to aid in the decision-making process of continuously improving the CI system and the employee participation in it.

While this study focussed on identifying a list of specific elements and factors to help managers improve employee participation in CI, our findings invite a broader discussion regarding how managers should approach CI systems' management and design. While much has been written about looking at the technical details of a CI system, it is important that managers remember to maintain a broader perspective by offering attention not only to the technical aspects of a CI system but also to the behavioural component of CI. This is why the agreed list of relevant elements could be also turned into a tool to manage employee intention to participate, something that is regarded as essential for the success of any CI system. Furthermore, the model presented here (which has the theoretical validation of expert opinion) could also help managers to make decisions about which strategies to follow when trying to sustain and improve their CI systems, understanding that one of the main determinants of CI success is achieving long-term employee participation. In addition, this model represents a very good starting point for further theoretical and empirical research about the topic

6 EMPIRICAL STUDY OF CIAM

6.1 INTRODUCTION

Based on the theoretical model developed in the previous chapter, this section of the thesis aims to present the empirical validation of the CIAM model. Structural equations modelling (SEM) based on Partial Least Squares (PLS) was used to conduct the statistical analysis of both the measurement model and the relationship model. The input for the statistical analysis was obtained from data gathered through a survey to employees of a large manufacturing plant. Given that only data from one specific company was used, the empirical validation should not be regarded as a general validation of the model, but as a first validation in one specific case. Notwithstanding this limitation, and given the objectives of this thesis, this first empirically validation provides very interesting information and knowledge about how the different determinants of employee participation interact with each other in a real case, encouraging future implementations and trials in other companies. The characteristics of the statistical analysis conducted have been already explained in Chapter 3. Next, details about the dataset used for the study and the main results obtained regarding the validity of the measurement and relationship models will be explained. Finally, the main conclusions derived from the results are presented and discussed.

6.2 CHARACTERISTICS OF THE DATASET USED

To conduct the empirical validation of the CIAM model, 308 answers from employees from a manufacturing and assembly plant located in Spain were used (accounting for almost 40 percent of the total amount of employees in the company at the moment of the survey). This company is part of a multinational group that is very committed to quality and excellence both in products and processes.

The company's CI system consisted primarily of two different established employee participation processes. On the one hand, employees have the option to participate in CI activities or projects that are mainly connected with manufacturing problems. On the other hand, all employees are encouraged to participate in a formal suggestion process. This process has a formal methodology for submitting suggestions by means of a standardized written form, for analysing the suggested improvement or change and for giving the appropriate feedback to the employee. Both processes have been functioning for many years, with moderately good results. Therefore, we believe the answers to be valid and relevant for this study, given that the surveyed employees work in a company developing CI activities.

6.3 EMPIRICAL VALIDATION OF CIAM MODEL

All 14 variables included in the model in Figure 19 (See Chapter 5) are considered to be latent variables, meaning that these variables cannot be observed in a direct way, but instead they are inferred through a set of other variables (which are directly measured and are called indicators). For each latent variable included in the model, many other indicators are needed to measure it. In this case, 55 observed variables grouped into 14 latent variables were used to construct the questionnaire needed to test for the model's relationship validity (See Appendix A).

6.3.1 STATISTICAL ANALYSIS

After collecting all 308 answers, the next step of this research was to conduct statistical analysis to validate the measurement instrument used and the structural model hypothesized. In order to establish statistical validation for the measurement model and the structural or relationship model, SEM analysis was conducted. In particular, PLS- SEM method run in SmartPLS® software was used.

Before analysing the reliability and validity of the scales used and the structural relationships between the variables, it was necessary to examine whether the sample was large enough to carry out the intended empirical study.

To do so, we calculated the power of the test (Chin & Newsted 1999; Hair et al. 1995), which was 99,99%. We can, therefore, state that the number of informants in the study was high enough to test the model (Cohen 1988).

6.3.2 VALIDITY OF THE MEASUREMENT MODEL

In order to test the quality of the measurement model developed, and given that the indicators were reflective (i.e. the assertions express aspects of the latent variable they measure), the measurement instruments used had to be reliable and valid.

To test the reliability of the measurement instrument the following were used: Cronbach's Alpha, the composite reliability index (CRI) and the calculation of the average variance extracted (AVE) (Fornell and Larcker, 1981). As can be seen from Table 28, the measurement instrument does not appear to raise problems in reliability since all of the Cronbach's Alphas are above the recommended value of 0.7 (Nunnally and Bernstein, 1994). Additionally, the CRI is above the recommended value of 0.7 for all factors (Carmines and Zeller, 1979), and the average variance extracted is above 0.5 (Fornell and Larcker, 1981). To ensure convergent validity, it was necessary to remove one item from the scale (SE1), as it had a factor loading below 0.6 (Fornell & Larcker 1981). Additionally, there does not seem to be evidence of significant problems regarding discriminant validity since, as Table 29 shows, the AVE for each factor is above the square of the correlation between each pair of factors (Fornell and Larcker, 1981, Henseler et al., 2009).

The measurement instrument used in this study, therefore, can be said to be reliable and valid.

Table 28 - Convergent validity and reliability of measurement model

Construct	Indicator	Mean	STDEV	Loading	t-value	Average loading	Cronbach's alpha	CRI	AVE
(F1) Employees' intention to participate in CI	IP1	3,8	1,1	0,95	111,54	0,80	0,86	0,90	0,64
	IP2	3,8	1,0	0,95	135,29				
(F2) Employees participation in CI	P1	3,4	1,1	0,89	39,93	0,90	0,76	0,89	0,80
	P2	3,3	1,0	0,91	51,27				
(F3) CI Alignment	A1	3,0	1,2	0,83	33,98	0,80	0,86	0,90	0,64
	A2	2,9	1,1	0,88	55,66				
	A3	3,0	1,1	0,85	49,14				
	A4	2,7	1,2	0,76	26,95				
	A5	2,9	1,3	0,66	16,36				
(F4) Self-efficacy	SE1	3,7	1,0	NA	NA	0,82	0,76	0,86	0,67
	SE2	3,5	1,1	0,77	24,83				
	SE3	2,8	1,1	0,86	48,16				
	SE4	2,6	1,2	0,84	37,26				
(F5) Communication	C1	2,7	1,1	0,82	31,64	0,82	0,84	0,89	0,67
	C2	2,7	1,1	0,84	48,68				
	C3	2,6	1,1	0,81	35,26				
	C4	2,9	1,1	0,80	36,57				
(F6) Empowerment	E1	2,5	1,1	0,88	45,95	0,86	0,89	0,92	0,75
	E2	2,6	1,0	0,91	82,94				
	E3	2,6	1,1	0,89	68,05				
	E4	2,7	1,0	0,77	21,74				

(F7) Ease of participation	EP1	2,9	1,0	0,88	47,64	0,88	0,85	0,91	0,77
	EP2	3,0	1,0	0,89	45,54				
	EP3	3,1	1,0	0,86	42,45				
(F8) Training	T1	2,7	1,1	0,88	58,47	0,87	0,89	0,91	0,76
	T2	2,8	1,1	0,90	67,50				
	T3	2,7	1,2	0,84	38,42				
	T4	2,8	1,1	0,87	54,33				
(F9) Recognition & rewards	I1	2,4	1,2	0,85	48,20	0,84	0,86	0,91	0,71
	I2	3,1	1,2	0,77	24,38				
	I3	2,4	1,1	0,89	76,26				
	I4	2,4	1,1	0,85	44,29				
(F10) Social influence	SI1	3,2	1,1	0,83	33,03	0,84	0,87	0,91	0,72
	SI2	2,9	1,0	0,83	30,05				
	SI3	3,2	1,0	0,85	43,46				
	SI4	2,8	1,1	0,89	55,08				
(F11) CI methodology	M1	3,3	1,1	0,73	22,50	0,83	0,85	0,90	0,69
	M2	2,8	1,0	0,86	45,58				
	M3	2,8	1,0	0,86	33,92				
	M4	2,9	1,0	0,87	55,94				
(F12) Job satisfaction	JS1	3,4	1,2	0,72	21,52	0,78	0,89	0,92	0,61
	JS2	3,4	1,2	0,76	24,53				
	JS3	3,2	1,1	0,84	38,08				
	JS4	3,2	1,2	0,80	36,39				
	JS5	3,1	1,1	0,82	37,57				

	JS6	3,1	1,1	0,76	28,26				
	JS7	2,9	1,2	0,76	29,26				
(F13) Organizational support	OS1	2,6	1,0	0,87	55,00	0,86	0,88	0,92	0,74
	OS2	2,6	1,1	0,90	81,46				
	OS3	2,8	1,1	0,84	47,32				
	OS4	2,8	1,0	0,83	34,39				
(F14) Usefulness of participating in the CI system	U1	3,2	1,0	0,89	50,71	0,89	0,91	0,94	0,79
	U2	3,4	1,0	0,91	72,47				
	U3	3,3	1,1	0,89	51,76				
	U4	3,2	1,1	0,86	48,49				

Table 29 - Discriminant validity of the measurement model.

Correlations	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14
(F1) Employees' intention to participate in CI	**0,95**													
(F2) Employees participation in CI	0,56	**0,90**												
(F3) CI Alignment	0,37	0,43	**0,80**											
(F4) Self-efficacy	0,43	0,39	0,60	**0,82**										
(F5) Communication	0,34	0,39	0,71	0,65	**0,82**									
(F6) Empowerment	0,27	0,39	0,66	0,68	0,73	**0,87**								
(F7) Ease of participation	0,38	0,42	0,67	0,58	0,64	0,64	**0,88**							
(F8) Training	0,33	0,37	0,74	0,65	0,73	0,76	0,69	**0,87**						
(F9) Recognition & rewards	0,33	0,36	0,72	0,66	0,73	0,73	0,60	0,75	**0,84**					
(F10) Social influence	0,44	0,50	0,71	0,61	0,62	0,70	0,63	0,66	0,67	**0,85**				

(F11) CI methodology	0,42	0,42	0,70	0,68	0,70	0,73	0,74	0,80	0,70	0,68	**0,83**			
(F12) Job satisfaction	0,47	0,48	0,73	0,66	0,64	0,64	0,58	0,62	0,65	0,75	0,62	**0,78**		
(F13) Organizational support	0,34	0,39	0,73	0,65	0,78	0,75	0,68	0,77	0,73	0,67	0,75	0,65	**0,86**	
(F14) Usefulness of participating in the CI system	0,55	0,56	0,55	0,61	0,58	0,60	0,55	0,55	0,54	0,64	0,64	0,63	0,56	**0,89**

Values in bold in the diagonal correspond to the square root of the AVE. Other values correspond to Pearson correlations

6.3.3 VALIDATION OF THE RELATIONSHIP MODEL

The main purpose of statistical techniques is to estimate the probability that the pattern seen in the sample data collected could have occurred of by the causes proposed by the theoretical model being tested instead by chance (Lowry and Gaskin, 2014).

In line with Hair et al. (2011) and Henseler et al. (2009), a bootstrapping process was carried out with 5000 resamples with the same size as the study sample (308 cases), in order to analyse the significance of the relationships found. Table 30 shows the values for the structural loading between the variables (β), the t-values showing the significance of the relationships, and the values for explained variance (R^2). As can be seen, explained variance (R^2) for the dependent factors (F1, F2, F4, F6, F7, F12, F14) is higher than 0.1, as Falk and Miller (1992) suggest.

Finally, we examined the predictive relevance of the analysis and checked the goodness of fit of the structural model. For this purpose, the predictive relevance analysis was supplemented by using the blindfolding sample re-use technique proposed by Stone (1974). An omission distance of five was used and Q^2 values above zero were obtained as recommended by Chin (2010). Thus, it can be concluded that the overall fit of the model is adequate.

Table 30 – Hypothesis testing (Path coefficients and t-values)

Hypothesis	Relationship	Path coefficient	t-value
H1	*Usefulness of participating in CI --> Intention to participate in CI activities*	0,490***	8,43
H2	*Ease of participating in CI --> Intention to participate in CI activities*	0,127*	1,68
H3	*Ease of participating in CI --> Usefulness of participating in CI*	0,038	0,55
H4	*Intention to participate in CI activities* --> Employees' *participation in CI activities*	0,440***	7,57
H5	*Social Influence --> Usefulness of participating in CI*	0,339***	5,28
H6	*Self-efficacy --> Ease of participating in CI*	0,108*	1,85
H7	Empowerment --> Employees' participation in CI	0,192***	2,84
H8	Job satisfaction --> Employees' participation in CI	1,177**	2,18
H9	CI recognition & rewards --> Job satisfaction	0,283***	3,68
H10	CI recognition & rewards --> Employees' participation in CI	-0,047	0,65
H11	Organizational support --> Intention to participate in CI	-0,020	0,26
H12	Organizational support --> empowerment	0,390***	5,58
H13	Organizational support --> self-efficacy	0,377***	5,57
H14	Organizational support --> Job satisfaction	0,226***	2,73
H15	Training --> empowerment	0,463***	7,35
H16	Training --> self-efficacy	0,357***	5,25
H17	Training --> ease of participation in CI	0,243***	3,52
H18	Training --> Job satisfaction	0,097	1,22
H19	CI methodology --> Usefulness of the CI system	0,281***	3,45
H20	CI methodology --> Ease of participating in CI	0,472***	6,94
H21	Communication --> Usefulness of the CI system	0,162*	1,96
H22	Communication --> Job satisfaction	0,184***	2,59
H23	CI alignment --> Usefulness of the CI system	-0,024	0,33
R^2 (F1) = 0.31; R^2 (F2) = 0.393; R^2 (F4) = 0.475; R^2 (F6) = 0.643; R^2 (F7) = 0.58; R^2 (F12) = 0.51; R^2 (F14) = 0.496			
Q^2 (F1) = 0.26; Q^2 (F2) = 0.27; Q^2 (F4) = 0.3; Q^2 (F6) = 0.47; Q^2 (F7) = 0.43; Q^2 (F12) = 0.29; Q^2 (F14) = 0.37			
*p-value<0,1; **p-value<0,05; ***p-value<0,01			

The results support the statement that the intention to participate in CI is directly related by perceptions of usefulness of participating in the CI systems

(β=0.49; p<0.01) and with the ease of the participation in the CI (β=0.127; p<0.1). Moreover, the employee´s intention to participate in the CI activities has a direct impact on the real participation in the CI (β=0.44; p<0.01), as well as Empowerment (β=0.192; p<0.01) and Job satisfaction (β=0.177; p<0.5). Respecting the other elements of the modified TAM, on one hand, social influence (β=0.339; p<0.01), communication (β=0.162; p<0.1) and CI methodology have a direct impact (β=0.281; p<0.01) on usefulness of participating in the CI. On the other hand, Self-efficacy (β=0.108; p<0.1), Training (β=0.243; p<0.01) and CI methodology (β=0.472; p<0.01) have a direct impact on Ease of participation in the CI system.

Moreover, Training (β=0.357; p<0.01) and Organizational support (β=0.377; p<0.01) have a direct impact on Self-Efficacy. Complementarily, Organizational Support (β=0.39; p<0.01) and Training (β=0.463; p<0.01) have a direct impact on empowerment. Finally, Job satisfactions is influenced by Organizational support (β=0.226; p<0.01), Communication (β=0.184; p<0.01) and CI recognition & rewards (β=0.283; p<0.01)

Then, Figure 20 shows the path effect for all the relationships. In this case, 18 out of the 23 hypothesis tested were found significant. Also, R^2 values were between 0.31 and 0.64 and Q^2 values were greater than zero for all dependent variables, showing good power and the predictive relevance of the relationship or path model.

6.4 DISCUSSION

The objective of this study was to present a new model of the organizational factors that are able to motivate employees to participate in CI activities. This model was empirically validated using SEM-PLS and based on the responses of 308 employees at an industrial manufacturing plant.

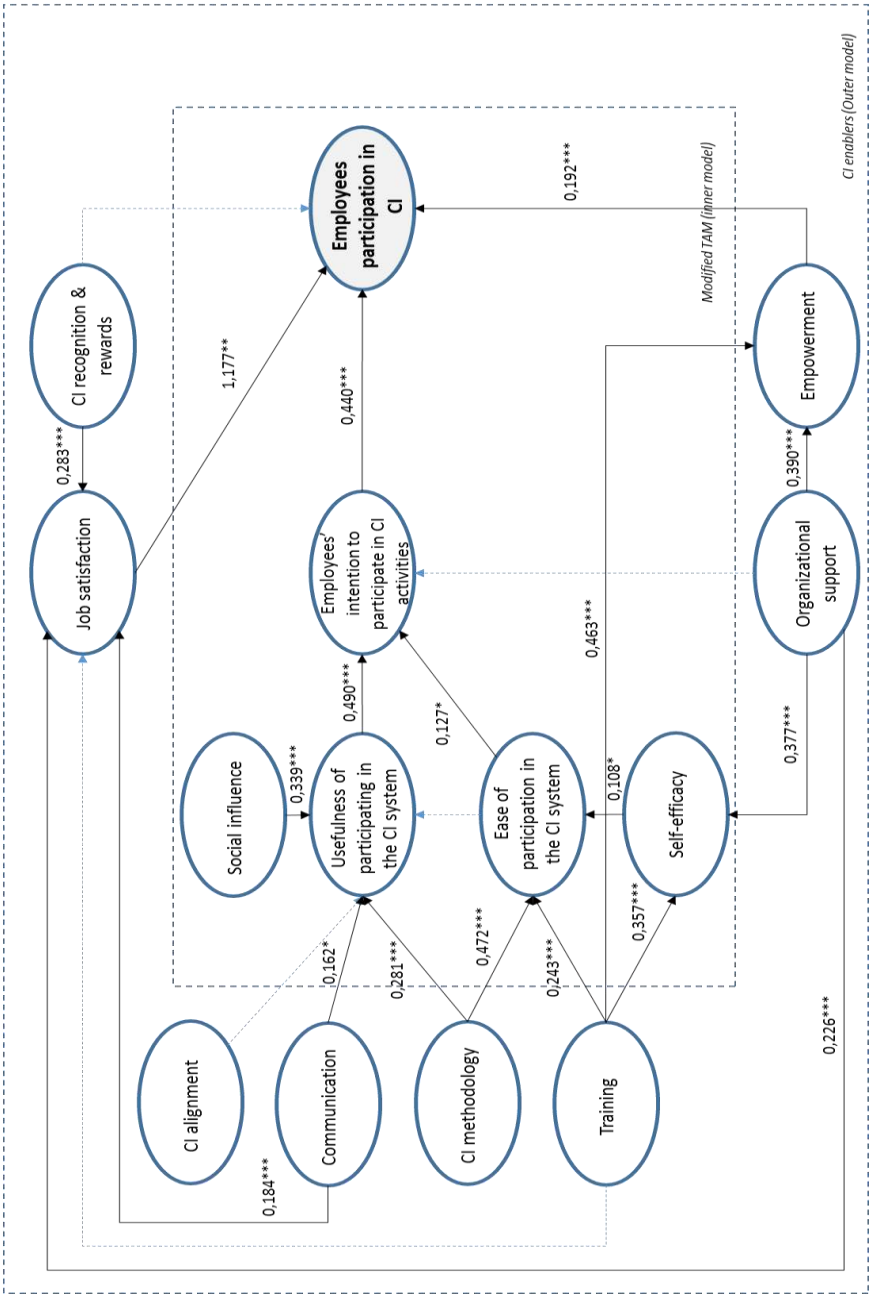
CI enablers (Outer model)
Modified TAM (Inner model)
Employees participation in CI
CI recognition & rewards
Job satisfaction
Employees' intention to participate in CI activities
Empowerment
Organizational support
Social influence
Usefulness of participating in the CI system
Ease of participation in the CI system
Self-efficacy
CI alignment
Communication
CI methodology
Training
0,283***
1,177**
0,440***
0,192***
0,390***
0,463***
0,490***
0,127*
0,339***
0,108*
0,377***
0,357***
0,162*
0,281***
0,472***
0,243***
0,184***
0,226***

Figure 20 – Empirical model. Dotted arrows are non-validated hypothesis. Values correspond to the path coefficients (*p-value<0.1; **p-value<0.05; ***p-value<0.01).

The first important result obtained from the empirical validation of the model was the possibility of understanding participation in CI by using employees' intention to participate in these kinds of activities. As mentioned earlier in the literature review section, this relationship has been found to be significant for many other behaviours in many disciplinary fields. In particular, this positive relationship also supports the findings of Tang et al. (2010) for the case of employee participation in quality improvement activities.

Moreover, based on the review of similar models in other related areas of knowledge, the TAM model originally developed by Davis (1989) was considered as an inner layer for our tested CIAM model. The TAM model, originally intended to understand technology acceptance, has been successfully adapted to represent the case of participation in the aforementioned CI activities. Similar successful attempts to modify the TAM model in order to study other behaviours outside technology have been documented for the case of certification of non-profit organizations (Slattern 2010). In this study, two variables from the TAM were proven to predict employees' intention to participate in CI activities: usefulness of participating in the CI activities and ease of participating in the CI activities. These findings are very interesting as they show that the TAM model can actually be used for a broader range of behaviours than it was originally conceived for. Also, for the specific case of CI, the positive relationship between usefulness and intention to participate supports the findings of Tang et al. (2010) and proves the importance of making employees aware of the benefits that participating in CI brings to them individually and for the company in general. This also support the findings of Rapp and Eklund (2007), who showed that in order to have active employee participation in the long-term, it was important for employees to see the personal benefit they would get from submitting suggestions. In other words, the present study provides empirical proof that supports the argument for not imposing change, but rather for making people understand why they need to change and getting their engagement to be driven

by their own understanding of the importance of adopting CI behaviours. Yet in contrast to what happens in the TAM model, no significant relationship was found between ease of participating and usefulness. This could be explained by the inclusion of a new antecedent variable, called CI methodology, which refers to the set of practices, techniques and tools used within the CI system to achieve the established objectives and which has a significant relationship with both determinants (usefulness and ease of participating).

Based on the findings of Venkatesh and Davis (2000) and Venkatesh and Bala (2008) with regard to TAM antecedents, two other variables considered as part of the inner layer of the CIAM model were self-efficacy and social influence. In this case, these variables were considered to be determinants of the variables ease of participating and usefulness, respectively. The reasons for introducing these variables as antecedents of behavioural intentions, which are also related to aspects of subjective norms and behavioural control or facilitating conditions, can be found in the work of Ajzen and Fishbein (2010) as a general case and in the work of Tang et al. (2010) on continuous quality improvement. Our findings suggest that employees perceived participating in CI activities as more useful as long as their support network (supervisors, colleagues, friends) think positively about their participation. This could open a discussion about, for example, the important role that unions could play in terms of acting as enablers or as a barrier of employee participation in CI. Moreover, the positive effect that self-efficacy has on perceived ease of use (and indirectly on employees' intention to participate) supports Yeh (2003) arguments about how people with high self-confidence in their own capabilities and skills regard complex tasks as challenges to be mastered rather than as threats to be avoided.

With regard to the antecedents tested for perceived usefulness, apart from social influence, communication also has a positive significant impact. This results support the idea that communicating outcomes in improvement systems, usually with the support of visual tools, is a key factor in sustaining improvement systems (Jaca et al. 2014; Aloini et al. 2011; García et al. 2014). On the other hand, CI alignment, also tested as an antecedent of usefulness, did not have a significant impact in the company analysed. This is contrary to the experts'

opinion during the Delphi study. One possible explanation for this result could be that employees do not necessarily need to have a clear focus or objectives related to CI in order to find participation in CI activities useful, but rather they see the usefulness from a mere pragmatic point of view and in terms of direct benefits in their daily work.

The CIAM model also tested some antecedents for perceived ease of participating in the CI activities. Apart from self-efficacy, positive significant relationships were found for training and CI methodology. Also, training and organizational support were significantly correlated with self-efficacy. These results align with Venkatesh and Bala (2008) recommendations for pre- and post-implementation of a system change, in which they state that both training and organizational support are likely to lead to greater user acceptance and system success. Organizational support was also found to be significantly correlated with job satisfaction, employees' intention to participate, and empowerment. These findings support arguments for management support and championship being one of the most important success factors for complex systems (Liang et al. 2007). Moreover, it has been argued by Venkatesh and Bala (2008) that top management support in relation to system implementation is critical for the legitimacy of the implementation process and can help employees reduce the anxiety related to using the system, therefore influencing the determinant of perceived ease of use and external control (empowerment).

In terms of the determinants of actual employee participation in CI systems, apart from employees' intention to participate, three additional antecedents were tested. First, empowerment turned out to be positively correlated. This supports the findings of Tang et al. (2010), extending the results from participation in quality improvement to general participation in the CI system. It also supports Karia and Asaari (2006) and Fryer et al. (2007), who argue that employee empowerment is a critical factor in CI success. Another determinant of participation was job satisfaction. This finding is consonant with various claims that people invest more time and go the extra mile when they are in roles they find enjoyable and satisfying (Macey & Schneider 2008; de Menezes 2012). Furthermore, it has been argued that in addition to the task itself, the conditions

surrounding the work are important. The job satisfaction construct used in our model has many of the Gallup Q12 questions about working conditions, which have been correlated with employee engagement in behaviours resulting in superior performance improvement in terms of productivity, customer satisfaction, revenue and turnover (Harter et al. 2003). Finally, another determinant tested was the presence of reward systems to motivate employee participation. Interestingly, this relationship was not significant, yet it did present an indirect path through job satisfaction. The importance of rewards and incentives in promoting CI participation is not clear in the CI literature (Rapp and Eklund, 2007). Although there are some contradictory findings, many authors believe that adequate reward systems that recognize employees' efforts in CI activities can positively influence employee motivation and participation (Singh & Singh 2012; Daily & Huang 2001). One possible explanation for not finding a significant relationship in this study could be that the company did not choose an appropriate reward method, something which is regarded as a common and complex problem for managers to tackle (Kerrin & Oliver 2002). Moreover, the indirect path found in this study could partially support the conclusions of Kerrin and Oliver (2002) regarding the need of organizations to select appropriate reward systems in order to increase participation in CI activities and yield beneficial effects on job satisfaction and absenteeism.

In terms of practical application, our CIAM model could help managers and practitioners to have a better understanding of the reasons why employees choose to participate in CI activities. This could allow them to better design existing CI systems inside organizations, based on employee perceptions.

6.5 CONCLUSION AND LIMITATIONS

The CIAM model presented in this thesis represents a new way of understanding employee participation in CI activities. The inner layer of the model, based on a modification of the TAM model, shows that it is possible to understand employees' intention to participate in CI activities based on their perception of how useful and how easy it is for them to participate in the CI system. Also, the findings in this chapter enable employee participation to be

understood in terms of employees' intention to participate, how satisfied are they with their working conditions (environmental context for CI), and how many real opportunities for participation exist (empowerment). Moreover, the second layer of the model presents how the different CI enablers cited in recent CI literature serve as antecedents for the aforementioned variables.

Fourteen latent variables (with 55 indicators) were used in the CIAM model. The model was empirically tested in a manufacturing plant that is strongly committed to quality and excellence. The main results show that employees' participation in CI activities was determined by employees' intention to participate, empowerment, and job satisfaction. Meanwhile, employees' intention to participate was determined by perceived usefulness of participating in the CI system and perceived ease of participating in the CI system. Perceived usefulness was, in turn, determined by communication, CI methodology and social influence. Perceived ease of participating was determined by methodology, training and self-efficacy. Training and organizational support were positively correlated with self-efficacy and empowerment. Meanwhile, organizational support, communication and rewards were all positively correlated to job satisfaction.

Finally, this research contributes to the academic knowledge by presenting a model that includes new variables and new interactions, which is not very common in the CI literature but is supported by other research in social studies and are worth investigating in greater depth in the future. Given some limitations in obtaining real first hand data form employees participating in CI activities, the model was tested in only one manufacturing plant located in Spain and thus, more empirical research is needed both in other industries and locations to see how the model behaves in different scenarios. In addition, the model was tested for participation in improvement projects and making suggestions, which were the two main type of activities conducted at the surveyed company, so in order to be able to generalize this model to any CI system, other companies with other types of CI activities should be examined.

Based on the aforementioned limitations, the empirical model discussed here should be regarded as CIAM v1.0. Future research steps should include further

validation in different scenarios and contexts, in order to follow a path towards a more general and matured version of the CIAM model. Nevertheless, based on the evidence presented here, this first model could help both academics and practitioners to better understand what influences employees' decisions to participate and engage in CI activities, allowing for CI systems to be better designed in order to achieve long-term sustainability. In addition, this first empirical validation with the theoretical model, appears to be very interesting to show the value and potential of the CIAM model, encouraging more academics to continue researching about how to improve the model, while encouraging more companies to join this validation process by trying out the CIAM model in their companies.

7 APPLYING THE CIAM MODEL AS A DIAGNOSTIC TOOL

7.1 INTRODUCTION

Finding ways of measuring the critical factors motivating employee participation can help practitioners manage the employee participation process accordingly. This chapter presents the application of CIAM model as an innovative diagnostic tool to measure the main determinants associated with the implementation of CI systems affecting employee participation in improvement activities. The aim of this chapter is to show how the initial version of the CIAM model (validated in the previous chapter) could be used in practice as a tool to help practitioners to understand and manage the determinants of employee participation in their companies.

We already discussed that in order to succeed in achieving a high degree of employee involvement in CI activities, managers should acknowledge the main factors associated with affecting employee motivation to participate in CI activities, finding ways to manage them accordingly. They should also find good ways to measure them. After all, what cannot be measured cannot be managed.

In the literature review section, it was discussed the importance of having good measures to manage the CI system in a successful way. In particular, some previous recent work reveal that, at least in Spain, there is a gap between what companies should do and what they really do in terms of using a holistic approach towards measuring all the relevant factors considered, especially when it comes to measuring the soft side of the improvement programs. In particular, a study conducted by Jaca et al. (2012) showed that although 90 percent of companies had metrics to measure achievement and implementation of results, less than 40 percent had metrics to measure involvement of task force. Moreover, less than 20 percent had metrics to measure other intangible aspects of the

system such as communication, teamwork promotion, participant recognition and managerial commitment, all elements related to employee commitment. Furthermore, as shown in chapter 4 in the exploratory phase of this research, the interviews with ten high performing companies in the Basque country found a general lack of metrics that reflect the state of the CI process in terms of its critical success factors, including a lack of measures related to employee involvement and employee satisfaction. In that occasion, one of the arguments posed was that the lack of this kind of measures could be related to the great difficulty that managers see in quantifying the impact of each activity, mainly because the results come from the use of intangible assets. Finally, the survey made to industrial companies in the Basque Country and Navarra regions, also shown in chapter 4, showed that less than 30 percent of the surveyed companies measure non-economic benefits and other more soft-variables such as employees' satisfaction with CI participation.

In view of these findings, developing new ways of measuring employee determinants for CI participation in an effective and transparent way, is a topic worth researching. The objective of this section is to present the practical application of a user's perspective diagnostic tool to measure the main organizational factors affecting employee participation in CI, based on the CIAM model. The tool was used in two case scenarios: a manufacturing plant and a public service organization.

A description of the diagnostic tool, the methodology used, and the results from these applications are shown next. Finally, a conclusion about the main results and the usefulness of this diagnostic tool to monitor and managed employee participation and its organizational determinants is presented in this chapter.

7.2 METHODOLOGY

The diagnostic methodology is based on the CIAM model, considering the measurement model and the relationship model.

A questionnaire intended to be applied to all employees within the studied company has been developed. The assessment of the company is completed by analysing the results from this questionnaire plus a discussion with the company's managers in order to gain further insights into the reality of the CI system and employee participation.

Figure 21 shows the phases and steps of this CIAM diagnostic survey, which are described as following:

- **Phase 1 – Understanding the company and its CI system**
  - **Step 1:** Conduct a meeting with the surveyed company's managers in order to have a first contact with their CI system. In particular, extract information about the characteristics of the CI system in place, level of employee participation, and managerial concerns and reflections about the perceived level of success of the CI system.
  - **Step 2:** Once the assessment is agreed, use the company's information to personalize the general version of the questionnaire to include the particularities of the company being studied.
- **Phase 2 – Designing the survey**
  - **Step 3:** Develop, in collaboration with the company's managers, a communication strategy to spread the word about the survey. This step is important in order to get employee buy-in. Therefore, efforts should be made to get the approval of the union (if one exists) in the first place, and then be able to reach all employees, ideally in a face-to-face manner (could be through general meetings, or by more informal interactions).
  - **Step 4:** Decide on how the survey is going to be administered. There are two options, either using internal resources from the company, or asking for external resources such as a research team. Here, it is also important to

decide when employees will be allowed to complete the survey (within production hours, in their free-times or at home). Managers should also agree on whether the questionnaire will be delivered in paper or through a web-link.

- **Phase 3 – Applying the survey**

  - **Step 5:** Conduct some pilot tests to verify that the questionnaire is clear and simple enough to be completed by all intended employees. A verification of the length of the survey (in terms of minutes) should also be done to ensure that employees will have enough time to complete it in a proper way (having time to think about the questions and answer them honestly). This should be done by asking a random sample of employees from different functional levels to complete the survey before administering it to the whole population, and asking them for their comments and suggestions. If this cannot be done for any reason, then at least, someone from the company should look at the questionnaire and give feedback about possible problems.

  - **Step 6:** Administer the survey to all employees within the company, or to a statistically representative sample. Special efforts should be made in order to ensure that all employees have the opportunity to answer the questionnaire. They should also be assured anonymity in order to help them respond without external pressures. It is important to assign dedicate personal to this task. It is also recommended to have a clear target of the minimum response level desired (based on the size of the company and the number of characterization variables used, in order to have sufficient data to analyse results). This will help the dedicated personnel to take corrective actions during the administration of the survey in order to achieve this target.

- **Phase 4 – Analyse results**

  - **Step 7:** Collect all the answers and analyse the information. The analyses is done according to three levels. The first level involves analysing strengths and weaknesses of the CI system. The second level involves taking a closer

look at the reasons why each factor could be perceived as strong or weak, by looking at the item level of the model. Finally, the third level includes a statistical analysis about the most critical paths affecting employee participation, by looking at the relationship model of CIAM.

- **Step 8:** Discuss results with the company's managers. Help them reflect about the results, and whether they were expected or not by the company. It is also interesting to compare the perceptions of the employees with real facts from the company's CI system.

- **Step 9:** In view of the findings and the discussion, make a final report with main results and an action plan with recommendations for the company as to how to improve their CI system from the focus of improving employee participation in CI.

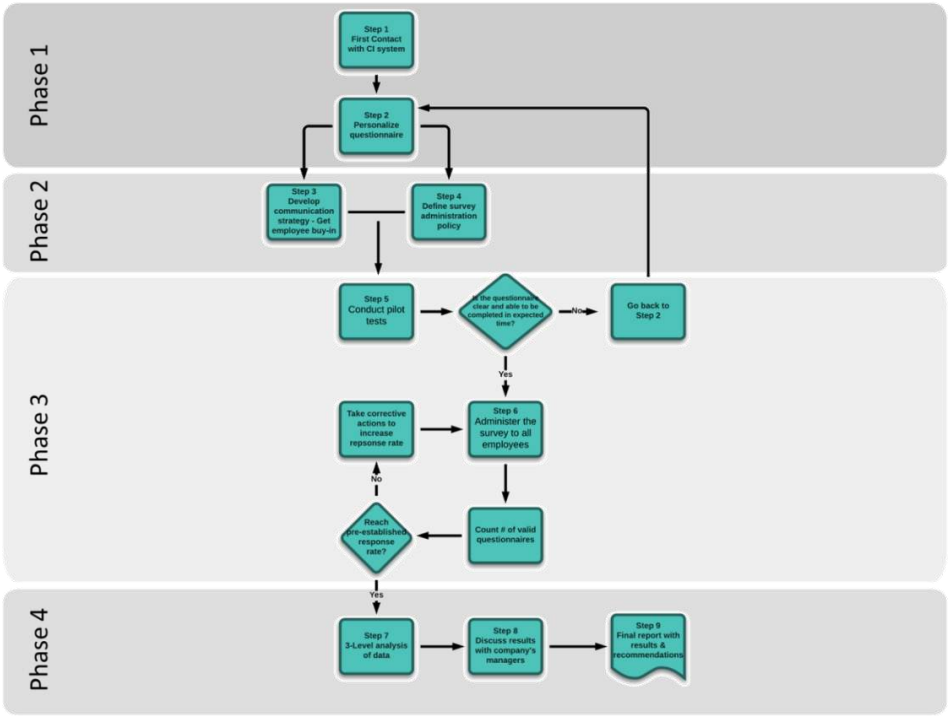

Figure 21 - CIAM 9-step diagnostic methodology

Next, the main characteristics of the general survey (Step 2) are explained with more detail. Afterwards, two examples of the use of the 9-step CIAM diagnostic methodology are explained. Finally, some conclusions about the use of this methodology are expressed.

7.3 SURVEY CHARACTERISTICS

As mentioned earlier, most of the items included in the survey were adapted from the CIAM model developed in chapter 5.

First, some characterization variables must be included, depending on the interests of the surveyed organizations. Typical variables include: Job type (e.g. administrative/managerial and shop-floor), age, gender, section within the company (this is especially interesting when different parts of the organization have different working habits), years working for the company (this could be interesting for older companies that have applied different CI methods during the years), level of employee CI participation in the past. This is particularly important to enable the subsequent analysis (after survey administration) to include a comparison of different groups of interest expressed by the company's managers, improving the conclusions derived from the data obtained.

The final version of the questionnaire includes 55 items grouped into the 14 factors of the CIAM model already discussed in previous chapters (also, some extra items could be included as control variables for the study). The recommendation is that all items are measured using a 5-point Likert-scale, being 1 'totally disagree' and 5 'totally agree' with the given statement.

Finally, taking into consideration the mix paradigm approach discussed in Chapter 3, it would be more interesting to include both quantitative and qualitative information to conduct the assessment of the company's CI system in terms of CI participation. With this objective, some open-ended questions could be added to the questionnaire, with the intention to further understand employees' reasons for not participating in the CI system, as well as collect their feelings and ideas about how to improve the CI system to make it more attractive for employees to participate.

Two more elements of the questionnaire are worth mentioning. The first one is that at the top of the questionnaire it is important to include a phrase explaining to the respondents what they should understand as participating in the CI system. In particular, the type of CI activities taken into consideration for this assessment should be detailed. Many times, especially in companies with well-established CI systems in place, this is achieved by listing all the names of the different CI activities in place (e.g. name given to the suggestion system in the company, 5S activities, name given to improvement teams, name given to other kaizen activities). This is important, in order to have everyone reflecting and answering about the same activities (in other words, sharing a common mental model). The second aspects worth mentioning is that anonymity was ensured during all the surveys. This is essential to allow employees to answer honestly, without feeling anxious or worried about being observed or measured by their supervisors.

7.4 USING CIAM METHODOLOGY

As mentioned earlier, two different cases were selected to show the application of this diagnostic tool. One private manufacturing company and one public city hall, both located in Northern Spain, were selected for this purpose. Both projects were conducted during 2015. One of the reason for choosing these different cases (private manufacturing and public service) is to show the versatility of the diagnostic tool under different scenarios. In particular, given the existence (in the Basque Country) of an excellence framework for companies and (more recently) another specific excellence framework for public institutions, with both containing a pillar about the human dimension, we thought it was very interesting to test our diagnostic tool in both scenarios to see whether it could serve for both purposes.

Following the aforementioned recommendation and instructions showed in the survey characteristic section, a specific questionnaire was developed for each case. Both, paper and on-line versions have been created and are available for use by interested companies. A version of the final questionnaire developed for both of these cases appears, in its generic form, in Appendix B. Given that most of the

question derived from the list of elements found during the Delphi study (shown in Appendix A), it has been decided to keep the document in the original format and language in which it was used (Spanish). Translated versions to other languages (Euskera and English) are available with the authors.

7.4.1 CASE 1: PRIVATE MANUFACTURING PLANT

7.4.1.1 PHASE 1: UNDERSTANDING THE COMPANY AND ITS CI SYSTEM

The first company selected for this study is the manufacturing and assembly plant used to validate the CIAM model in the previous chapter. As it was mentioned, it is part of a multinational group that is very committed to quality and excellence both in products and processes. At the time of the survey, the plant employed around 800 people (counting both white and blue collar workers) distributed across three shifts per day.

As mentioned before, the company's CI system consists of two different established employee participation processes: participation in CI activities or projects that are mainly connected with manufacturing problems, and participation in a formal suggestion process. Both processes have been functioning for many years, with moderately good results. One of the reasons argued by the company to conduct the survey was to better understand what was necessary to help increase employees' motivation to participate in the CI system.

Because they had recently merged two divisions into one single facility, and these two divisions had different maturity stages in terms of CI working habits, they were interested in seeing how these differences were perceived by their employees.

This is why they insisted in including as the main characterization variable the division of the employees surveyed (we will call them Sector A and Sector B). Other characterization variables included were age, years within the company,

level of participation during 2014 (previous year), and job position (shop floor or managerial/administrative level). The last part of personalizing the questionnaire consisted of including at the beginning one sentence explaining the objective of the survey and an explanation of what should be understood by employees as improvement activities (in this case the suggestion system which had a specific name within the company and the improvement teams).

7.4.1.2 PHASE 2: DESIGNING THE SURVEY

All the organization and planning of the survey was conducted between the research team and the industrial plant manager. The survey was administered during 2015. In this case the target population were all employees within the factory including: managers, middle managers, and line-workers.

During these meetings, the research team emphasized in the importance of having what we could call 'employee buy-in', meaning that employees really understand the importance that achieving a high degree of participation in the survey had on the survey's results, therefore getting employees' commitment to responding. To do this, the research team developed a communication strategy which consisted first of sending a letter explaining the project to the company's union. After their approval, a second wave of communication began, this time focused on reaching all employees. This strategy consisted of hanging posters announcing the survey in all the main common areas of the factory one week before the survey, e-mailing and briefing all middle-managers about the importance of getting their teams answering the survey, and asking them to cascade these information down the chain of command. Finally, the research team went to the factory one day in advance, stood at the entrance of the factory during all the changes of shift, and brief all employees face-to-face as they enter for work (also giving them a short leaflet which replicate the information in the posters). As another way of getting this intended 'buy-in', the company also offered to raffle between all the employees participating in the survey. To ensure anonymity in the survey results, the research team attached a separate ticket to the survey sheet, so that the ticket was thrown into one box and the survey sheet in another different box.

After agreeing on the activities to get employee buy-in, the research team and the industrial manager decided about the survey administration strategy. In this case, the survey was administered in paper, and the pre-established target was at least 300 answers (based on recommendations of the company given previous response rates for other similar surveys). To achieve this target, members of the research team were at the entrance of the company at every change of shift in order to give empty questionnaires to all employees on their way in to the factory, and collect all completed questionnaires of employees leaving for their homes. Also, members of the research went personally through all the company's offices to distribute empty questionnaires to administrative and managerial-level employees. Furthermore, members of the research team were present at the factory (especially during breaks) to assist employees with any doubt, and encourage them to answer the survey during their free time.

7.4.1.3 PHASE 3: PILOT TEST AND SURVEY ADMINISTRATION

After designing the survey process for the company, one pilot test was conducted. Two employees, from different functional levels and sections within the company, were selected. They were explained the project and asked to complete the questionnaire. They were then asked to give their feedback about the length of the survey and the clarity of the concepts included in the survey. After they approved that the survey was clear enough and that it was able to complete it in an adequate time (about 10 minutes), the survey was ready to be administered.

At the end of the administration process which lasted two full days, a total of 308 answers were collected, meaning a 40 percent response rate. A summary of the main characteristics of the achieved sample is shown in Table 31.

Table 31 - Main characteristics of sample in manufacturing plant

Manufacturing Plant N=308			
Occupational classifications		**Has made improvement suggestions in 2014**	
White-collar	95	Yes	75
Blue-collar	207	No	217
No information	6	No information	16
Gender		**Has participated in CI activities in 2014**	
Male	242	Yes	123
Female	62	No	166
No information	4	No information	19
Age		**Years of service**	
<=35	105	<5 years	67
36-50	178	6-10 years	64
>51	15	>11 years	135
No information	10	No information	42
Division			
Sector A	223		
Sector B	40		
Both Sectors	37		
No information	8		

7.4.1.4 PHASE 4: ANALYSING RESULTS

As mentioned in the description of the CIAM methodology, the analysis will be presented in three levels. First, an analysis of the mean scores in each of the 14 factors included in the CIAM model. This first level shows the strengths and the weaknesses of the elements of the CI system, according to the perception of the employees of the company. Then, in a second level of analysis, the mean scores for each of the items included in each of the 14 factors will be examined. This second level could give the company some clues or specific reasons about why the mean score in the factor was either relatively low or high. For these two levels, both general results as well as some interesting subcategorizations will be shown. Finally, a third level of analysis will be presented. Statistical analyses will be conducted, based on PLS, to find out which relationships from the CIAM

model appear to be stronger for this particular company. This could be useful for managers to know which areas of the CI system should be strengthen.

Finally, from the two open-ended questions about employees' suggestions and comments about the CI system, two list will be extracted. First, a list of the main arguments explaining why employees choose not to participate in the current CI system of the company. Second, a list of the main improvement suggestions for improving employee participation will also be presented.

Level 1: factor-level analysis

First, a bar chart with the scores for all the factors included in the survey is displayed in Figure 22. The x-axis intersects the y-axis in the middle of the scale (y=3). This allows seeing high scores above the x-axis and low scores below the x-axis, facilitating the detection of strengths and weaknesses of the CI system according to the perception of the employees (solid filled rings are inserted when the score of the factor is exactly 3 for better visualization).

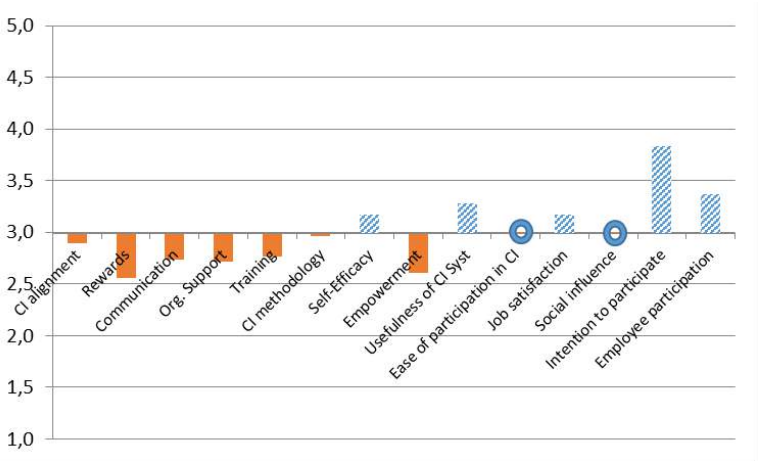

Figure 22 - Industrial case: general mean perceptions

Second, the results from the survey were analysed according to the main characterization variables selected by the organization as the most relevant. In the industrial case, results in Figure 23 shows the comparison between employees from Sector A (N=223) and employees from Sector B (N=40). It is

interesting to mention that employees from both sections (N=37) were not considered, but had very similar behaviour in the score pattern as employees belonging only to Sector B. The results are shown in the form of radar charts.

Figure 23 – Industrial case: comparison between Sectors

Level 2: item-level analysis

By looking at the score of each of the items included in the different factors, we can further detect possible causes for the mean score of the factor. This could help the company explain the scores and reflect as to which strategies could be adopted to improve the perception of each factor. Table 32 shows the scores for all the items in the questionnaire. The first column shows the name of the factor, column 2 identifies each item according to the question number in the questionnaire (See Appendix B). Columns 3 and 4 shows the mean general scores for the items and the factor, while columns 5 to 8 show the mean scores for Section A and Section B for the items and the factors.

Table 32 - Mean item-scores for the general sample and subcategorized in Section A and Section B

		General		Sector A		Sector B	
Factor	Question	Item score	Factor	Item score	Factor	Item score	Factor
CI alignment	P1	3,0	2,89	2,8	2,77	3,5	3,22
	P2	2,9		2,7		3,4	
	P3	3,0		2,8		3,3	
	P4	2,7		2,7		2,9	
	P5	2,9		2,8		3,1	
CI recognition & rewards	P6	2,4	2,56	2,2	2,42	2,7	2,82
	P7	3,1		2,9		3,5	
	P8	2,4		2,3		2,6	
	P9	2,4		2,3		2,6	
Communication	P10	2,7	2,74	2,6	2,66	3,0	3,05
	P11	2,7		2,7		3,0	
	P12	2,6		2,5		2,9	
	P13	2,9		2,9		3,3	
Organizational Support	P14	2,6	2,72	2,5	2,62	3,0	3,14
	P15	2,6		2,5		3,1	
	P16	2,8		2,8		3,3	
	P17	2,8		2,7		3,2	
Training	P18	2,7	2,77	2,6	2,60	3,0	3,08
	P19	2,8		2,6		3,1	
	P20	2,7		2,6		3,2	
	P21	2,8		2,6		3,1	
CI methodology	P22	3,3	2,96	3,2	2,85	3,4	3,21
	P23	2,8		2,7		3,1	
	P24	2,8		2,7		3,1	
	P25	2,9		2,8		3,3	
Self-Efficacy	P33	3,7	3,17	3,7	3,11	3,8	3,28
	P34	3,5		3,5		3,5	
	P35	2,8		2,7		3,1	
	P36	2,6		2,6		2,7	
	P37	2,5		2,4		3,0	

Empowerment	P38	2,6	2,61	2,4	2,48	2,9	2,98
	P39	2,6		2,4		3,0	
	P40	2,7		2,6		3,0	
Usefulness of CI system	P41	3,2	3,28	3,2	3,20	3,5	3,46
	P42	3,4		3,3		3,5	
	P43	3,3		3,2		3,5	
	P44	3,2		3,1		3,4	
Ease of use	P45	2,9	3,00	2,8	2,86	3,4	3,45
	P46	3,0		2,9		3,5	
	P47	3,1		2,9		3,5	
Job Satisfaction	P48	3,4	3,17	3,4	3,15	3,4	3,23
	P49	3,4		3,4		3,2	
	P50	3,2		3,2		3,2	
	P51	3,2		3,1		3,3	
	P52	3,1		3,1		3,4	
	P53	3,1		3,0		3,1	
	P54	2,9		2,8		3,1	
Social Influence	P55	3,2	3,00	3,1	2,89	3,5	3,28
	P56	2,9		2,8		3,1	
	P57	3,2		3,1		3,4	
	P58	2,8		2,7		3,1	
Intention to participate	P26	3,8	3,83	3,8	3,80	3,9	3,80
	P27	3,8		3,8		3,8	
Participation	P28	3,4	3,37	3,4	3,31	3,6	3,48
	P29	3,3		3,3		3,4	
Control variables	P30	4,4	3,97	4,4	3,94	4,2	3,97
	P31	3,9		3,8		3,9	
	P32	3,6		3,6		3,8	

Level 3: relationship analysis

As already mentioned, a third level of analysis, based on PLS will be presented to find out which relationships from the CIAM model appear to be more strong for this particular company. All 308 answers were used to conduct the PLS analysis. The results are shown in Figure 24. The details of how to conduct this statistical analysis was already explained in Chapter 6. In this case, different colours were included to show, in an easier and more visual way, the different values of the betas for each of the paths (or relationships) appearing in the model.

Figure 24 - Level 3 analysis for industrial case

Employees reasons and improvement suggestions

Finally, based on the answers to the two final open-ended questions about improvement ideas for the CI system and about problems hindering employee participation, the answers were analysed and grouped according to the ideas expressed. A summary of the top problems are shown in Table 33. Likewise, a list

of the main ideas for improving employee participation are presented in Table 34.

Table 33 – Main problems hindering employee participation in the industrial case

Problems hindering Employee participation	# Opinions
Lack of information/knowledge about the CI system	21
I do not feel considered or required by the company	20
Lack of available time	8
The Company doesn't give me enough chances to participate	7
Lack of knowledge about how the company functions	7
Previous disappointment with the CI system	6
Employees feel that the first priority for the company is to produce	6
Lack of proper motivation	6
Lack of communication between employees and supervisors	6
Employees' proposals are neglected	6
Unfair treatment between employees in terms of allowing for their participation	6
Lack of specific proposals to participate	5
I do not believe in the current CI system	4
Unfair treatment in terms of the rewarding system	4
Improvements are only focus on improving the company not the employee	3
Lack of employee interest	3
Lack of resources	2

Table 34 - Improvement ideas in the industrial case

Improvement ideas	# Opinions
Have more information about the CI system and its activities	15
Better rewards and incentives	15
More motivation from the company to participate and improve	14
More time to think and reflect about improvement ideas for the workplace	14
Better communication and more friendly treatment between subordinates and employees (more empathy with the worker)	10

Those responsible for the CI system should really listen and value the proposals of all workers	9
Receive more faster and personalized feedback	9
Make employees feel important and valued	8
Communicate the importance of the CI activities and its objectives	7
More specific CI training for employees and supervisors	7
Greater recognition from supervisors to their subordinates	7
Regular meetings for sharing ideas (e.g. 5-minutes meetings before the shift or at least weekly)	6
Reduce the pressure to produce (leave room for improvement)	6
Give more opportunities to participate	6
Listen more to the workers in the shop floor, which are the ones who best know the problems in their workplace	6
More variable economic incentives, based on employee participation	5
Better training and preparation of supervisors to lead CI activities	5
Not only search for productive improvements, but also worry about improvement related to improving working conditions	4
Create multi-disciplinary teams	3
Improve the working environment	3
Fair treatment among all employees	3
Make it possible to make suggestions through the internet	3
Increase awareness of the CI activities	3

7.4.2 CASE 2: PUBLIC SERVICE ORGANIZATION

7.4.2.1 PHASE I: UNDERSTANDING THE COMPANY AND ITS CI SYSTEM

The second organization selected, was a city hall, located in the Basque Country region. The city hall has recently started to work with CI systems focused on improving service quality. At the time of the survey, the city hall employed around 300 people between administrative and street brigades.

The main interest for conducting this survey was that the city hall was starting in their CI journey, and therefore, wanted to see what people inside the organization had to say about the implementation of the CI activities already established.

Because they had recently started with improvement activities, they were interested in seeing whether employees that had already participated in the system perceived the different aspects of the CI system differently than how the non-participant employees perceived them. This is why they included some questions about participation in the last year as their main characterization variable. They also included other characterization variables to the survey such as age, years within the company, job position (office or street brigade), and area of work. The last part of personalizing the questionnaire consisted of including at the beginning one sentence explaining the objective of the survey, and an explanation of what employees understand as improvement activities. In this case, this explanation included a list of activities conducted inside the city hall as part of their quality improvement system focused on improving quality of service. Given that the city hall is used to working in two languages, Spanish and Euskera (native language from the Basque country), the list of improvement activities appeared in both languages.

7.4.2.2 PHASE 2: DESIGNING THE SURVEY

All the organization and planning of the survey was conducted between the research team, the mayoress and the quality technician. This application was also backed up by involving a consultancy firm already working with the city hall. Because of this, one senior consultant was included in the research decision-making group. This survey was conducted during 2015 and the target population were all employees including: administrative and street brigades.

The communication strategy was conducted by hanging posters announcing the survey in all the main common areas, e-mailing all the office-based employees, and organizing two face-to-face sessions to explain the survey (one for office-based employees and one for field-based employees or street brigades).

In this case, two different methods were used to administer the survey (step 4). Paper and on-line forms (through web links) were offered to all employees in the office. Paper versions were offered to employees working in the street. A special day and time was agreed, and communicated to employees in the street, to answer the survey at the city hall facilities. In addition, given that the city hall

usually works both in Spanish and Euskera, the questionnaire was translated and offered in both languages. The process included two specific days (non-consecutives) in which office and street brigades' employees were invited to answer the survey in paper. Also, for all the office-based employees, who had access to a computer during working hours, a one-week extra period was provided in order for them to complete the survey at the web link provided.

7.4.2.3 PHASE 3: PILOT TEST AND SURVEY ADMINISTRATION

In this case, the pilot test were conducted with the senior consultant and with our counterpart in the city hall. In particular, special focus was taken during this pilot to ensure that the meaning in Euskera was as similar as possible to the meaning of the questionnaire in Spanish. A time length similar of around 10 minutes was also considered. Finally, given that in this case a web-link was also generated, further pilot tests were made to ensure that the link was working properly and that the answers were recorded. After they all approved that the survey was clear enough, that the meanings in both languages were the same, and that the link was working properly, the survey was ready to be administered.

At the end of the administration process, 62 answers were collected, meaning around 20 percent response rate (although it is a moderate low response rate, the number of answers was enough to conduct all the intended analyses including PLS). A summary of the main characteristics is shown in Table 35.

Table 35 - Main characteristics of sample in city hall

City Hall N=62			
Occupational classifications		**Has made improvement suggestions in 2014**	
Office based	36	Yes	27
Field based	22	No	33
Other	4	No information	2
Gender		**Has participated in CI activities in 2014**	
Male	26	Yes	35
Female	35	No	25

No information	1	No information	2
Age		**Years of service**	
<=35	4	<5 years	7
36-50	44	6-10 years	6
>51	13	>11 years	42
No information	1	No information	7

7.4.2.4 PHASE 4: ANALYSING RESULTS

The three level analysis was conducted for this case. A list of the main arguments for not participating in the CI system, and a list of the main improvement opportunities to improve employee participation will also be included.

Level 1: factor-level analysis

First, general results are displayed in a bar chart with the scores for all the factors included in the survey being shown in Figure 25. The x-axis intersects the y-axis in the middle of the scale (y=3).

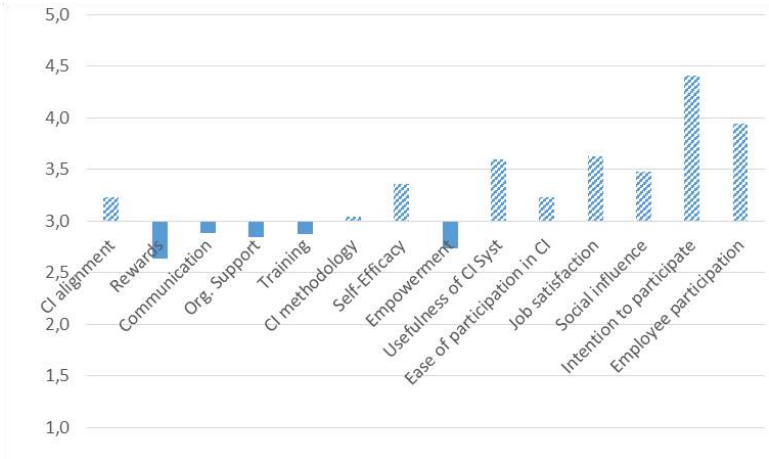

Figure 25 - Service case: general mean perceptions

The results from the survey were analysed according to the main characterization variables selected by the city hall as the most relevant. In this case, Figure 26 shows the comparison (using radar charts) between the mean

perceptions of employees that have at least participated in some improvement projects or have made suggestions during 2014, and employees who have not participated nor in projects nor through the submission of improvement suggestions during 2014.

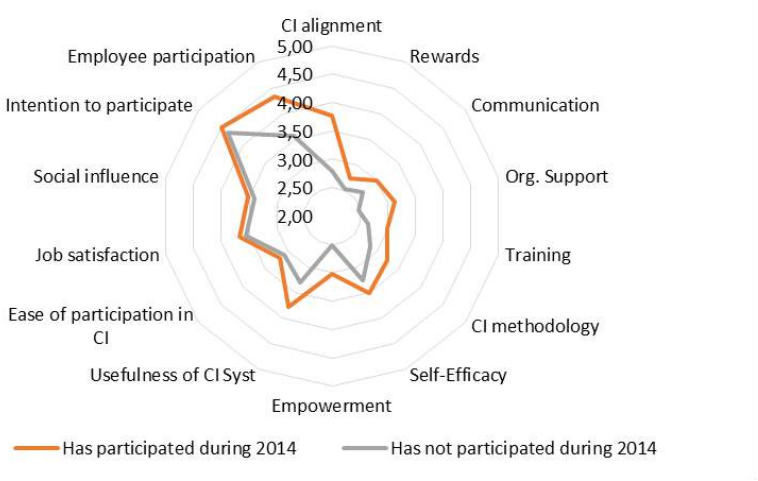

Figure 26 – Service case: comparison between participants and non-participants

Level 2: item-level analysis

As with the industrial case, here the aim is to see inside the 14 factors of the model. By looking at the score of each of the items included in the different factors, we can further detect possible causes for the mean score of the factor.

Table 36 shows the scores for all the items. The first column shows the name of the factor, column 2 identifies each item according to the question number in the questionnaire (See Appendix B). Columns 3 and 4 shows the mean general scores for the items and the factor. Columns 5 to 8 show the mean scores for the items and factors subcategorized by the group of employees that have at least participated in some improvement projects or have made suggestions during 2014, and the employees who have not participated nor in projects nor through the submission of improvement suggestions during 2014.

Table 36 - Mean item and factor scores for city hall case

		General		Have participated		Have not participated	
Factor	Questions	Item score	Factor	Item score	Factor	Item score	Factor
CI alignment	P1	3,3	3,23	4,0	3,76	2,8	2,80
	P2	3,7		4,4		3,3	
	P3	3,2		3,5		3,0	
	P4	2,9		3,2		2,5	
	P5	3,0		3,6		2,5	
CI recognition & rewards	P6	2,0	2,64	2,0	2,73	2,1	2,52
	P7	3,8		4,0		3,7	
	P8	2,4		2,6		2,3	
	P9	2,3		2,3		2,0	
Communication	P10	2,8	2,88	3,0	3,01	2,6	2,68
	P11	2,8		3,0		2,6	
	P12	3,0		3,0		2,7	
	P13	3,0		3,1		2,8	
Organizational support	P14	2,7	2,84	3,0	3,13	2,2	2,47
	P15	3,0		3,3		2,5	
	P16	2,8		3,0		2,6	
	P17	2,9		3,2		2,6	
Training	P18	2,8	2,87	2,9	3,00	2,6	2,65
	P19	3,0		3,1		2,6	
	P20	2,9		3,0		2,9	
	P21	2,8		3,0		2,5	
CI methodology	P22	3,4	3,04	3,5	3,24	3,2	2,85
	P23	2,9		3,1		2,8	
	P24	2,8		3,0		2,4	
	P25	3,1		3,4		2,9	
Self-efficacy	P33	3,9	3,35	4,2	3,50	3,6	3,26
	P34	3,9		4,1		3,9	
	P35	2,6		2,8		2,5	
	P36	3,0		2,9		3,0	
Empowerment	P37	2,7	2,73	3,0	3,02	2,6	2,51
	P38	2,7		3,0		2,5	

	P39	2,9		3,4		2,5	
	P40	2,7		2,8		2,5	
Usefulness of CI system	P41	3,5	3,59	3,6	3,78	3,3	3,30
	P42	3,7		3,9		3,4	
	P43	3,5		3,5		3,3	
	P44	3,7		4,1		3,2	
Ease of Use	P45	3,1	3,23	3,1	3,18	2,9	3,08
	P46	3,2		3,4		2,9	
	P47	3,3		3,1		3,5	
Job Satisfaction	P48	3,7	3,62	3,6	3,67	3,8	3,55
	P49	3,6		3,8		3,5	
	P50	3,4		3,6		3,4	
	P51	3,6		3,8		3,5	
	P52	3,6		3,6		3,5	
	P53	3,7		3,4		3,7	
	P54	3,7		3,8		3,3	
Social Influence	P55	3,5	3,48	3,6	3,52	3,2	3,41
	P56	3,7		3,6		3,8	
	P57	3,6		3,5		3,7	
	P58	3,1		3,4		3,0	
Intention to participate	P26	4,4	4,40	4,5	4,50	4,3	4,34
	P27	4,4		4,5		4,4	
Participation	P28	4,1	3,94	4,4	4,34	4,0	3,58
	P29	3,8		4,3		3,2	
Control variables	P30	4,6	4,36	4,5	4,53	4,6	4,24
	P31	4,3		4,6		4,2	
	P32	4,2		4,5		3,9	

Level 3: relationship analysis

Finally, a third level of analysis, based on PLS will be presented to find out which relationships from the CIAM model appear to be more strong for this particular company. All 62 answers were used to conduct the PLS analysis. The

results are shown in Figure 27. Different colours were used to represent paths with different betas.

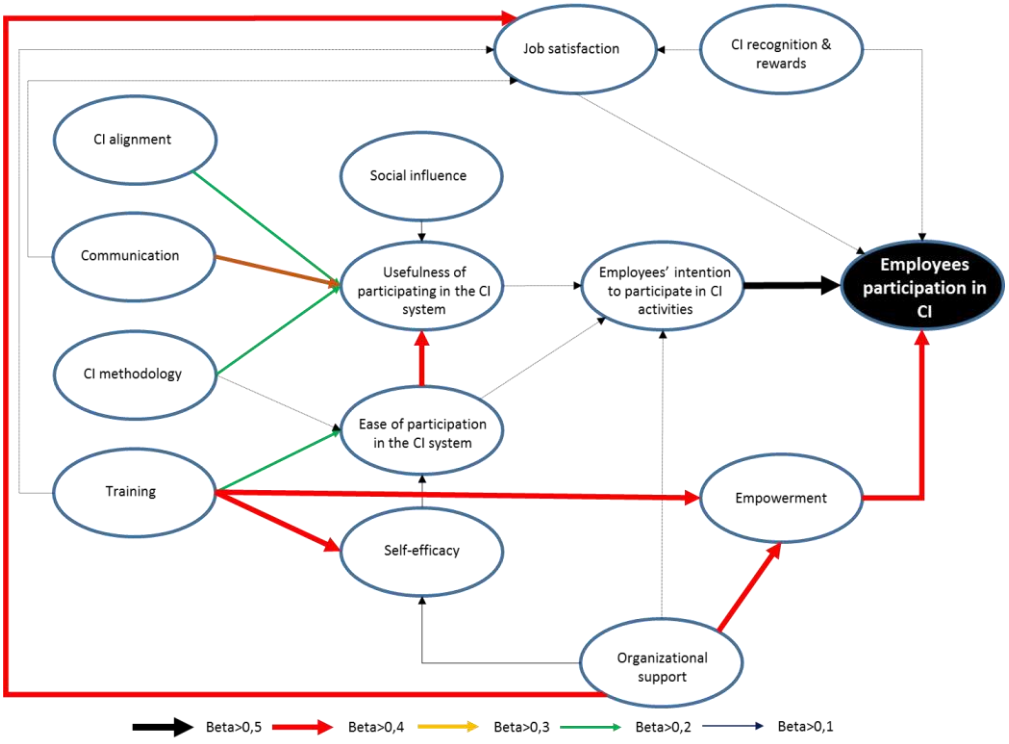

Figure 27 - Third level analysis for the city hall case

Employees reasons and improvement suggestions

Finally, based on the answers to the two final open-ended questions about improvement ideas for the CI system and about problems hindering employee participation, the answers were analysed and grouped according to the ideas expressed. A summary of the main problems are shown in Table 37. Likewise, a list of the main ideas for improving employee participation are presented in Table 38.

Table 37 – Main problems hindering employee participation in the city hall

Problems hindering employee participation	# Opinions
Lack of information/knowledge about the CI system	5

I do not feel considered or required by the company	3
Lack of specific proposals or projects to participate in	1
There is no real effort from the company to achieve employee participation	1
Lack of training in CI	1
Lack of greater commitment when establishing CI activities	1
I do not see the results of the CI system in my workplace	1
Incompatibility with working hours	1
Lack of interest from my immediate supervisor	1

Table 38 – Main improvement ideas to increase EP in the city hall

Improvement ideas	# Opinions
Have more information about the CI system and its activities	9
More specific CI training for supervisors and subordinates	6
Listen more to workers improvement ideas and problems, who are the ones that know best about the day-to-day operations on the workplace	6
More economic resources	4
More motivation to improve and participate	4
Better communication between employees and supervisors	1
Communicate the importance of CI activities and its objectives	1
Better recognition from the supervisors	1
More real opportunities to participate	1
Focus the CI system in also improving employees' workplace (not only the service provided)	1
Have supervisors and top management participating personally in the CI activities	1
More support from supervisors	1
Have the company be one proposing the different CI topics in which employees should work in	1
Channel employees efforts towards the general wellbeing and not towards personal benefits	1
More flexible working hours	1
Do not do it just to fulfill organizational or bureaucratic requirements	1
Communication of results	1

More cohesion along the chain of command	1
More improvement programs and more analysis	1
If workers understand that by involving in CI, they can improve and make their workplace more dynamic and secure, it is almost certain that they will always want to participate	1
Effective internal communication between departments and top management	1
More integration and cohesion inside the organization	1
Improve leadership and empowerment	1

7.5 DISCUSSION OF RESULTS

In the industrial case, the main weaknesses detected were: CI alignment, Rewards, Communication, Organizational Support, Training, CI methodology, Self-Efficacy and Empowerment. Reasons for strengthening these factors as a way of achieving CI success are well documented throughout CI literature as seen in the literature review section.

When looking at the industrial case results, it is interesting to see these weaknesses appearing in a company with a structured and formal CI system in place. Yet, when debriefing the results with the industrial manager of the company, he validated our results arguing that the company had the systems but they were not accordingly promoted and embedded into daily management and work. This is a proof of what other authors have stated about implementing a formal methodology being a necessary but not sufficient condition for CI success (Kaynak 2003). It has been proven that it is important to support and leverage the technical methodology with all the other soft and intangible human factors already discussed in order to succeed in the CI journey (Yang and Yang, 2013). Another interesting point of the analysis in favour of the benefits of the diagnostic tool is the fact that the tool was able to detect differences between groups adequately. In particular, results show that employees in Sector B, which was the one with the most advanced CI working habits perceived the different aspects of the CI system in a better way than those employees working in Sector A.

In terms of the relationships, by looking at the PLS analysis in figure 24, we see that one of the most important relationships are between training and empowerment. Even more interesting is the strong relationship appearing between perceived usefulness of the CI system, employee intention to participate and perceived employee participation. This third-level analysis, as we called it, could serve the company to direct efforts (and the limited resources) to those relationships with more possible impact in improving employee participation.

Finally, looking at the arguments mentioned by the employees about why they were not motivated to participate, some interesting findings arise. For example, among the top three most mentioned, we see that employees feel that they lack of information and knowledge about the CI system, they do not feel considered or required by the company and they feel that the company does not provide them with enough time to participate in the CI system. This is highly valuable information for managers, since they are feeling coming directly from the users of the system. Therefore, the company should focus on increasing employees' awareness about the existence of a CI system and the different activities available, they should try to motivate them by acknowledging the key role employees play in this process and they should improve their working practices and habits to include time for CI. Other main ideas for improving the CI system to make it more attractive for workers to participate, once again collected from the employees' feelings, relate to feeling more valued (better recognitions and fair treatment) and improving the relationship and communication between supervisors and their employees. Once again, the company should understand the active role that employees plays in the CI system, and should therefore make and extra effort to boost cohesion and collaboration along the whole company, creating a harmonic atmosphere in which CI can develop properly.

In the city hall case, the main weaknesses perceived by the employees were: Rewards, Communication, Organizational Support, Training, CI methodology, Self-Efficacy, and Empowerment. Because this is an institution starting in the CI journey, it is essential that these weaknesses and the improvement opportunities are addresses accordingly. Results show that employees who have participated

in the improvement system have a better perception of the critical factors involved in the CI system than those who have not yet participated. A possible argument for these results could be the employee resistance to change, something highlighted in the literature as one of the main barriers to CI implementation (García et al. 2013), and how that resistance can make employees adopt a negative prejudice. In that sense, one common good practice often used in CI is to make the 'believers' (those who have already participated in the system) teach using their own example to the rest of the employees and help convince them to join in the CI process.

By looking at the relationship model in figure 27, we see a strong relationship between the training received, the organizational support perceived and the level of employee empowerment employee feel to have. Furthermore, a strong relationship is verified between empowerment, employee intention to participate and perceived employee participation. This paths are important as they show managers (and in this case politicians) a possible way of encouraging their employees to participate in the CI system.

When looking at the main problems hindering employee participation in the city hall, employees feel that they do not have enough information and knowledge about the CI system, and that they do not feel they have real opportunities to participate. Some of the main ideas for improving the system included: having more information, more specific CI training for both supervisors and subordinates, to pay more attention to improvement ideas and problems made by employees (who are the ones that know best about the day-to-day operations on the workplace), assign more economic resources to the system,, and improve communication between employees and supervisors. As with the industrial case, ideas related to understanding the real value of employees within the CI system, giving real opportunities to participate and create a better environment in which CI can develop arise. It is important that managers understand these current problems perceived and take into consideration employees' feelings and ideas on how to make them more motivated to involve and participate in the CI system.

7.6 CONCLUSIONS AND LIMITATIONS

These two applications are, as usually happen with most of the research conducted, subjected to some limitations. In our opinion, one of the main limitations is that participation in the survey was voluntary in both cases. In particular, in the city hall we could only achieve a 20% response rate. This could partially explain why the results in terms of employee intention to participate and employee participation was in general moderate-high in both cases. It is therefore possible that these two variables have a lower score for the entire population. Nevertheless, the scores of the sampled groups in both cases are still very interesting to analyse their perception of the system, mainly because according to the same bias, they represent a perception based on their own experience. Furthermore, the arguments about current elements from the system hindering employee participation and the main improvement opportunities detected could make the whole organization improve.

After looking at both set of results, and after discussing the results with the people responsible for the CI systems in both cases and verifying that the results obtained reflected the reality of both places, we can conclude that using this diagnostic tool can help managers to detect some of the main weaknesses and barriers hindering employees from participating more actively in the CI process. It also allows to detect many improvement opportunities as to how the CI system should be improved in order for employees to feel more interested and motivated to participate. By adopting a user approach, managers will be more effective in the decisions they take in order to improve employee participation and commitment. This is particularly interesting for Basque organizations, both public and private, since the Basque government is eagerly promoting business excellence through the application of two Basque excellence frameworks (one for public and another similar one to public organizations), in which in both cases there is a whole chapter or pillar related to people development inside the organization. Nevertheless, since employee motivation and commitment is an essential success factor in all improvement systems, this tool offers great advantages for any manager wishing to improve the different aspects of the CI system responsible for motivating employee participation in these activities.

To conclude, this chapter presents how to develop practical applications from all the knowledge developed in the CIAM model presented in the previous chapters. In particular, an innovative diagnostic tool to measure the main organizational determinants associated with the implementation of CI systems and responsible for affecting employee participation in improvement activities has been developed and proven in two different scenarios. The tool conducts this analysis from a user perspective approach, guaranteeing that the weaknesses and improvement opportunities detected come directly from the users of the CI system themselves. The development of these kind of tools serves to translate the academic knowledge about CI into useful and practical tools that can be used by managers and other practitioners to actually manage the different aspects of the CI systems, in this case employee participation. This effort of taking academic knowledge and converting it into useful and practical tools for practitioners is a necessary exercise that needs to be done in order to help the organizations advance towards business excellence and innovation.

8 FINAL SUMMARY AND CONCLUSIONS

Given the rapid and ever changing reality of business, companies must seek new ways to remain competitive and increase their chances of survival. Implementing CI systems is one way to achieve this. In this thesis, after examining the many existing definitions over the years, we defined CI as *"the inter-related group of planned, organized and systematic processes of constant change across the whole organization, focused on engaging everyone within the organization into achieving greater business productivity, quality, safety, ergonomics and competitiveness"*.

Recent forms of CI systems base their success on the participation of all employees and on the careful analysis of processes in order to eliminate waste, meaning that the concept of CI appears within the main pillars of most of the current improvement philosophies or techniques, such as lean, TQM, Six Sigma and Lean Six Sigma. Throughout the literature, there is ample documentation of companies' successful implementation of CI, as well as the benefits that successful implementation accrues to the company.

Despite the many benefits cited, it has been argued that one of the main difficulties of CI systems is actually sustaining the process in the long-term, and therefore many researchers have been motivated to study the factors that underlie CI sustainability. Throughout this thesis, we have delved into the importance of achieving the active involvement of everyone in the organization as one of the main issues regarding CI sustainability.

Based on the findings from the literature review, it is clear that organizations need to understand that the human dimension of CI should be one of the focuses of any given CI system, since it is the channel through which technical solutions are created and put in place. Therefore, organizations should learn to establish and maintain adequate systems for fostering active employee participation in CI.

Yet the problem of how to encourage employees to participate in CI systems still remains a significant challenge worth researching. Some of the main conclusions that emerged from the literature review were:

- People's willingness to participate in the CI system should be an objective sought by managers,
- Many CI initiatives fail due to the failure to properly manage the human dimension,
- Few companies have developed tools to measure the soft aspects of the CI system (in particular those related to the human dimensions),
- A list of CI enablers, understood as critical elements that are needed to sustain the CI system, has been established
- There is evidence showing the relationship between some of the enabling factors and CI behaviour (including employee participation), using well-established behavioural theories such as TRA, TPB and TAM to support their findings. This existing evidence allows for the possibility of applying these kind of theories to the CI context.

Based on these aspects, it was concluded that more research on the relationship between operations management and human resources management was needed. In particular, given that sustaining a CI system involves a cultural shift within the organization, with several critical factors enabling these changes, more research about how these enablers affect employee participation in CI was still needed.

During the exploratory phase of this thesis, new insights into the real implementation level of CI practices and habits in Spanish firms were obtained. Among the main conclusions from this part of the research, the following are worth highlighting. The results of the semi-structured interviews conducted in ten high performing companies in the Basque Country showed that although these companies were implementing many of the CI enablers highlighted in the literature, there was still room for many improvements. Furthermore, after analysing the results from the exploratory survey of Spanish manufacturers, a relationship between developing a series of CI enablers and attaining CI

sustainability as well as greater employee participation was found. Moreover, a general lack of CI measures, and in particular a lack of measures of the soft elements of the system related to the human dimension of the CI system, were detected.

Based on the results from the literature review and the exploratory phase we have just described, we argued that:

- Employee participation is essential for the success of CI systems
- The reasons why employees choose to participate are still not clear and more research on this topic is needed
- Companies lack specific metrics and tools to measure and analyse employee participation and their main antecedents

To address these statements, we conducted a second phase of the research, which included developing a comprehensive model called CIAM (Continuous Improvement Acceptance Model), with the objective of further understanding the reasons why employees choose to participate in CI activities. During the course of this thesis, we conducted a Delphi study and subsequently applied the ISM technique to develop the theoretical CIAM model. Then, an empirical validation of the theoretical relationships was conducted by running a SEM-PLS analysis using data obtained from employees of a manufacturing company that were applying CI in their workplaces. Finally, the CIAM model was used to develop a diagnostic tool to help managers to measure and manage the main organizational determinants of employee participation in CI.

With regard to the Delphi study, through a structured discussion with academics and practitioners, this study was able to assess a relationship model that the experts believed could help to explain what individual- and organizational-level elements trigger employees' intention to participate in CI activities. This exercise of joining academics, consultants and practitioners was also interesting in that it created a space for discussion between the academic and practical worlds, at a time in which more industry-university collaboration should be carried out in order to really advance along the path to excellence. At the end of this process, the experts agreed on a list of 44 critical elements, clustered into 10 factors that motivate employees to participate in the CI system.

Once this list was generated, experts were asked to discuss and propose possible relationships between the obtained list of factors and employee participation in CI. This discussion included the ten factors agreed upon during the Delphi process, two factors adapted from the TAM model, employees' intention and perceived participation. This 14-factor model was developed using the ISM approach, a well-established methodology for identifying relationships among specific items in order to analyse problems and systems in various fields.

The CIAM model presented in this thesis represents a new way of understanding employee participation in CI activities. The model presents itself as a first attempt to integrate all organizational factors affecting peoples' intention to participate in CI activities inside a company. In particular, the fact that this model contains many variables related to the CI system's characteristics and design presents an advantage over other models that depend exclusively on individual-level variables, since these variables are more easily managed by the company, allowing for better improvement opportunities to be detected.

The inner layer of the model, based on a modification of the TAM model, showed that it is possible to understand employees' intention to participate in CI activities based on their perception of how easy it is for them to participate in the CI system and how useful such participation is. In addition, the findings suggest that employee participation is best understood in terms of employees' intention to participate, how satisfied employees are with their working conditions, and what they perceive their level of empowerment to be in the company. The second layer of the model showed how the different CI enablers discussed during the Delphi process could serve as antecedents for the aforementioned variables. This model could help both academics and practitioners to better understand what influences employees' decisions to participate and engage in CI activities, allowing CI systems to be better designed in order to achieve long-term sustainability.

Finally, this thesis concluded with the development of a CIAM methodology, based on the CIAM model, intended to help managers diagnose and manage the aforementioned determinants of employee participation. A methodology consisting of 4 phases and 9 steps was developed. The tool was developed

following a user perspective approach, guaranteeing that the weaknesses and improvement opportunities detected come directly from the users of the CI system themselves. The methodology was then used in two different scenarios: a manufacturing plant and a city hall. After looking at both set of results, we concluded that using this diagnostic tool could help managers to detect some of the main weaknesses and barriers hindering employee participation. It also allowed us to detect many improvement opportunities regarding the design and implementation of the CI system in order to motivate employees to be more participative. Developing this type of diagnostic tool could be particularly interesting for companies adopting excellence frameworks, in which they usually include a whole chapter or pillar related to the development of people inside the organization, but there are not many tools able to diagnose this issue.

The development of these kinds of tools serves to translate the academic knowledge developed during this thesis into useful and practical tools that can be used by managers and other practitioners to actually manage the different aspects of the CI system in order to achieve greater employee participation.

To conclude, we would like to make some final remarks. First, although our research is focused on presenting the CIAM model and how it could be used within a diagnostic methodology, our findings should invite a broader discussion regarding how practitioners and academics should approach CI system management and design. While much has been documented about the technical aspects of a CI system, it is important that managers remember to maintain a broader perspective by also looking at the behavioural and human component of CI. Second, version 1.0 of the CIAM model presented in this thesis should be regarded as the starting point for future research into this topic. In particular, this future research should help deepen the understanding of employee participation in CI and the relationship with its determinants, resulting in the improvement, extension and consolidation of the CIAM model. Third, the CIAM model presented here could help managers to make decisions about which strategies to follow when trying to sustain and improve their CI systems, understanding that one of the main determinants of CI success is achieving long-term employee participation. Fourth, the effort of taking academic knowledge and converting it into useful and practical tools for practitioners, as we did by

developing the CIAM methodology, is a necessary exercise that needs to be done in order to help the organizations advance towards business excellence and innovation.

8.1 LIMITATIONS AND FUTURE RESEARCH LINES

As happens with most research, this thesis is subjected to some limitations. Given the time constraints of a typical PhD thesis and given the complexity of the problem and the ambitious nature of the proposed solution, it has been impossible to fulfil all the recommended steps for a full validation of a model with characteristics like the ones of the CIAM model presented here. In particular, because of the difficulties in gathering data from employees from companies applying CI, the model has only been validated using data from one manufacturing company. This constraint has made it impossible, for example, to make a cross validation of the results or to propose any kind of norm out of the measurement model. Therefore, the relationships were only validated for this particular scenario. However, although the CIAM model presented is considered the 1.0 version, the positive results obtained throughout the course of this thesis from both the academic and practitioners point of view allow many future research lines to exist.

To start with, the model was tested in only one manufacturing plant located in Spain, and thus more empirical research is needed, both in other industries and locations, to see how the model behaves in different scenarios. In addition, the model was tested for participation in improvement projects and making suggestions, so in order to able to generalize this model to any CI system, other companies with other types of CI activities should be examined.

Second, with the idea of extending the model to serve for different types of industries, different CI systems and even different management cultures, we have already started an international collaboration with academic colleagues from other countries. In particular, we are planning to conduct a global study to further validate the relationships presented in 1.0 version of the CIAM model. The idea is to conduct a global survey of employees working in different

countries, companies and with different CI systems. We expect to determine whether the CIAM model could behave differently depending on cultural aspects (particular of each country or region). We would also like to explore the possibility of finding some differences regarding the CI system implemented, given that each CI system, although similar in nature, has some particularities in terms of the CI activities and methodology used, and could therefore imply different behaviours from employees and the company, resulting in differences in the outcomes of the relationship model.

Third, regarding the CIAM model presented, mainly variables associated with the design of CI systems were included (with the exception perhaps of social influence and job satisfaction). This was done based on the understanding that these variables could influence employees' decision to participate, while also being variables that are relatively easy for the company to have an effect on. Furthermore, only the variables agreed upon during the Delphi process were included. Therefore, despite including elements that experts in CI agreed upon, other variables, for example for personal ones, could have been omitted from this study and could be worth investigating in the future to see whether including them could improve the CIAM model. In addition, new variables and interactions, some of them scarcely cited in the CI literature, were found during the CIAM development and it could therefore be worth investigating in greater depth in the future.

In this sense, we are currently conducting a project deriving from the CIAM development, called CIAM-Plus, in which the objective is to conduct an in-depth analysis, based on concept mapping techniques with employees and managers, of the managerial practices that most affect employee participation and commitment with CI activities. This project is funded by the Regional Government of Guipuzcoa, due to the region's interest in developing stronger working relationships in order to increase and sustain the competitiveness of Basque companies.

Finally, the application of the CIAM diagnostic methodology was only applied to two scenarios, both in northern Spain. Although the results from these two applications showed the potential of this tool and were found to be very

interesting by the managers in both cases, further empirical applications are recommended. In order to achieve this, the research team has been making contact with several companies both in Spain and in Uruguay. Furthermore, the research team has presented the characteristics and results of this CIAM methodology in several business and academic forums in order to increase the diffusion of this methodology within the academic and practitioner communities. From these efforts, several companies have shown interested in implementing the CIAM methodology in their workplaces, something that will probably happen in the near future.

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APPENDIX A – LIST OF FACTORS AND ELEMENTS

CI alignment

This factor measures the existence, definition, and understanding of the various CI goals, objectives and tasks set by the company.

1. Individual and collective CI objectives and goals are clearly established for all areas of the company
2. All CI objectives and goals are shared and understood by all employees
3. Employees believe that the objectives and metrics set are attainable and coherent with the company's current reality
4. All employees are assigned certain specific tasks and/or responsibilities within the CI system, based on their individual skills
5. All employees are involved in the definition and revision of the objectives and metrics in an open and collaborative way, and they are able to take corrective measures

Rewards

This factor measures the expectations of employees in connection with the relationship between their own effort inside the CI system and possible rewards given by the company

6. Employees recognize the existence of a reward system that it is both attractive and aligned with the rest of the compensation and rewards given by the company
7. Employees believe that their own effort (energy, time, resources) in participating in the CI system will determine some improvements regarding the company's working processes
8. Employees believe that they will receive a fair and visible reward in return for their participation in the CI system
9. Employees believe that the current reward system is attractive and motivates them to participate in the CI activities

Communication

This factor deals with the existence of good communication channels.

10. Employees believe that the company uses the different communication channels available to involve all employees in the evolution and progress of the various CI activities of the company
11. Employees receive all the information they need (in terms of quantity and quality) in order to improve their daily work
12. Employees are encouraged to communicate and exchange what they learn during the various CI activities with the rest of their colleagues
13. Employees have the necessary channels to express, in an open and effective way, their improvement ideas

Organizational support

This factor measures the existence of CI leadership and internal support by top management

14. Top management allocates the necessary amount of resources (energy, time, people, money) in order to enable and promote the continuous development of the CI system
15. Top management shows real involvement in the CI system by showing active leadership and participation in the different activities
16. All area/middle managers show visible involvement in the CI system by actively leading, guiding and giving formal follow-up to all CI activities in their area
17. The people leading all CI activities show a clear understanding of the CI system, and help the rest of employees to better understand how and why it is important to participate

Training

This factor involves any training activity that gives the employee the skills that are necessary or knowledge that is useful for participating in CI activities.

18. Employees perceive that the training received allows them to get sufficient knowledge and trust to participate in the CI system
19. Employees perceive that the training received allows them to better understand the rationale behind each of the CI activities and objectives sought by the company

20. Employees believe that the company encourages them to develop a set of capabilities in order for them to be able to continuously improve their daily work
21. Employees believe that the CI training received is useful for applying it to their own daily work in order to get real improvements

CI Methodology

This factor refers to the set of practices, techniques and tools used within the CI system to achieve the established objectives.

22. Employees are fully aware of all the practices, techniques and tools used to conduct all CI activities within their workplaces
23. Employees believe that the set of CI practices, techniques and tools used are agile, dynamic and effective
24. Employees believe that the problem solving techniques used within the CI system are useful for achieving long-term sustainable improvements in their workplaces
25. Employees believe that the set of CI practices, techniques and tools used for daily management of CI activities are useful for identifying routines that allow for better working habits

Self-Efficacy

This factor deals with the employees' confidence in their ability to participate in the various CI activities done in their workplace

26. Employees feel capable of completing the different CI activities done in their workplace in an autonomous way
27. Employees are confident that they can ask another colleague or their own supervisors for help whenever they get stuck in the middle of a CI implementation
28. Employees are confident that they have the necessary written and visual aids to help them complete the different CI activities done in their workplace
29. Employees feel confident that they have enough time during working hours to complete the various CI activities proposed for their workplace

Empowerment

This factor refers to all the participation possibilities employees feel they really have within the CI system

30. Employees believe that the company promotes real opportunities for employees to participate in the CI system by giving employees all necessary resources (materials, tools, information, time)
31. Employees believe they are encouraged by the company to lead CI activities within their workplace
32. Employees believe they are encouraged by the company to participate in making decisions about the CI activities taking place within their workplace
33. Employees believe that management carries out sufficient activities within the CI system to gather employees' opinions and feelings about possible improvement opportunities

Social Influence

This factor reflects all possible social influences the employee may receive from closely-related people (family, friends, colleagues, supervisors)

34. Employees believe that their supervisors think positively about them participating in the various CI activities done in their workplace
35. Employees believe that their work colleagues think positively about them participating in the various CI activities done in their workplace
36. Employees believe that their support network (people that support and give counselling during hard times) think positively about them participating in the various CI activities done in their workplace
37. Employees believe that their supervisors and other work colleagues motivate them to participate in the various CI activities through their own efforts and behaviours

Job Satisfaction

This factor involves all main elements affecting employees' own job satisfaction.

38. Employees believe they have a good working atmosphere in their working unit
39. Employees believe that their supervisors show them respect and trust and value their opinions and work
40. Employees feel satisfied with how the workload and responsibilities in their working units are organized
41. Employees feel a sense of belonging to the company they work for and feel responsible for their own processes

42. Employees feel satisfied with the general working conditions (health and safety, ergonomic, physical comfort, cleanliness and neatness)
43. Employees feel satisfied with their contract terms (payment, working schedule flexibility, job stability)
44. Employees feel their daily work helps them achieve personal and professional growth

Usefulness of Participating in the CI System

This factor measures the usefulness to the company and to the employee himself or herself of participating in the different improvement activities set by the company, as seen by the employee.

45. Participating in the CI system increases productivity in the workplace
46. Participating in the CI system improves the quality of the work done in the workplace
47. Participating in the CI system improves workplace conditions (ergonomics, health & safety, etc.)
48. Participating in the CI system contributes to personal growth and professional development

Ease of Participating in the CI System

This factor measures whether employees believe that participating in the different CI activities is a simple task, which requires no extra effort (mental and/or physical) when compared to other regular daily activities done in the company.

49. Employees believe that the methods, techniques and tools used to develop the different CI activities are clear and easy to understand
50. Employees believe that the methods, techniques and tools used to develop the CI activities are easy to learn
51. Employees believe that participating in the different CI activities set by the company do not require them an extra effort (mental and/or physical) as compared with other regular daily activities

Behavioural Intention to Participate in the CI System

"*Behavioural intention to participate*" *is understood as the voluntary predisposition that each employee has about participating in any of the different CI activities that the company promotes. The employees express their subjective opinion of whether they are willing to participate in the different CI activities encouraged by the company.*

52. Given that the company expects and encourages all employees to participate in the different CI activities, I (employee) am willing to participate in the improvement of my workplace
53. If I (employee) have the option to participate in any CI activities (although I do not feel any obligation from the company or from others), I would like to participate in the improvement of my workplace

Perceived Level of Participation in CI activities

Actual level of participation in CI activities perceived by the employees

54. Whenever I can, I put forward ideas and suggestions on how to improve my workplace
55. Whenever I can, I participate in the implementation and development of CI projects in my workplace

APPENDIX B – EMPLOYEE PARTICIPATION SURVEY

This section contains the original questionnaire used for the empirical field studies. For this reason, it has been decided to keep the document in its original language (Spanish). Translated versions to Euskera and to English are available with the authors.

Objetivo: Estudiar las percepciones de todos los trabajadores sobre las actividades de mejora continua de la empresa (Sistema de sugerencias y otras actividades de mejora)

IMPORTANTE: Para lograr una buena calidad de la investigación, es muy importante que usted responda a todas las preguntas a continuación.

Datos Generales

Puesto en la Planta:

- MOD (mano de obra directa)
- MOI (mano de obra indirecta)

Departamento/Sección:

- Xxxx
- Yyyy
- zzzz

Antigüedad en la compañía (años): _____

Edad:

- ‹25 años
- 25-35 años
- 36-50 años
- › 51 años

Género:

- Masculino
- Femenino

He realizado sugerencias formales en el 2014: o Si o No

He participado en actividades de mejora (de cualquier tipo) durante el 2014: o Si o No

A continuación, valore con **1 (totalmente en desacuerdo), 2 (en desacuerdo), 3 (ni de acuerdo ni en desacuerdo), 4 (de acuerdo) o 5 (totalmente de acuerdo)** las siguientes afirmaciones:

Preguntas	1	2	3	4	5
1. Existen para mi área de trabajo metas y objetivos de mejora continua (MC), tanto individuales como grupales					
2. Entiendo y comparto por qué se han fijado esos objetivos individuales y grupales					
3. Considero que los objetivos e indicadores propuestos son asumibles y coherentes con la realidad actual de la empresa					
4. En función de las habilidades personales de cada uno, se nos asignan tareas y/o responsabilidades claras y asumibles dentro del sistema de mejora continua (MC)					
5. Participo en la definición y revisión del cumplimiento de nuestras metas y objetivos de mejora					
6. Considero que existe un sistema de reconocimientos y recompensas que me resulta atractivo y alineado con las otras formas de retribución y promoción de la empresa					
7. Considero que mi esfuerzo personal (energía, tiempo, recursos) de participar en las actividades de MC permitirá mejorar los sistemas/procesos de trabajo de la empresa					
8. Considero que seré justamente recompensado y/o reconocido de manera visible para todos por mis aportes a la MC de la empresa					

Preguntas	1	2	3	4	5
9. Considero que el sistema actual de incentivos aumenta mi motivación a participar en las actividades de MC.					
10. Considero que existen y se utilizan los distintos canales de comunicación de la empresa para informarnos a todos del avance de las actividades de mejora					
11. Considero que obtengo la información que necesito, en tiempo y forma, para mejorar día a día mi trabajo					
12. Considero que se nos fomenta a intercambiar continuamente con los demás compañeros los conocimientos adquiridos al participar de las actividades de mejora continua					
13. Considero que existen dentro de la empresa canales apropiados para comunicar de forma abierta y efectiva mis ideas de mejora					
14. Considero que la Dirección destina los recursos necesarios (energía, tiempo de los directivos, personas, dinero) para facilitar e impulsar el continuo desarrollo y evolución del sistema de MC					
15. Considero que la Dirección muestra su clara involucración en los programas de MC mediante la participación y liderazgo en los mismos					
16. Considero que los responsables de cada área muestran de manera visible su compromiso con la MC al liderar, orientar y darle seguimiento formal a las actividades de MC en su área					
17. Considero que las personas que lideran las actividades de MC en la empresa, ayudan al resto de los trabajadores a entender cómo y por qué es importante que todos participemos					
18. Considero que la formación que recibo me aporta el conocimiento y confianza necesarios para participar en las actividades de MC					
19. Considero que la formación que recibo me permite entender las razones y los objetivos que la empresa quiere lograr a través de las actividades de MC					
20. Considero que la empresa busca fomentar en mí el desarrollo de una serie de competencias que me permitan mejorar continuamente mi trabajo diario					

21. Considero que la formación que recibo es útil y habitualmente puedo, una vez recibida, aplicarla en mi trabajo diario para obtener mejores resultados					
22. Conozco las prácticas, técnicas y herramientas a utilizar en mi área de trabajo para desarrollar las distintas actividades de MC					
23. Considero que la prácticas, técnicas y herramientas utilizadas dentro del Sistema de MC son ágiles, dinámicas y efectivas					
24. Considero que las herramientas de búsqueda y resolución de problemas utilizadas en la empresa permiten lograr soluciones sostenibles (largo plazo) en mi área de trabajo					
25. Considero que las prácticas, técnicas y herramientas utilizadas dentro de la gestión diaria permiten identificar y definir mejores rutinas o hábitos de trabajo					

Preguntas	**1**	**2**	**3**	**4**	**5**
26. Si la empresa me anima a que participe en las actividades de mejora continua, estoy dispuesto a participar para mejorar mi área de trabajo					
27. Si tengo la posibilidad de participar en las actividades de mejora continua (aún sin sentir ninguna obligación), me gustaría participar para mejorar mi área de trabajo					
28. Siempre que puedo, realizo sugerencias formales y comparto ideas sobre cómo mejorar mi área de trabajo (u otros aspectos de la empresa)					
29. Siempre que puedo, participo en la implementación y desarrollo de proyectos de MC en mi área de trabajo					
30. Siempre intento dar lo mejor de mí en el trabajo					
31. Considero que buscar formas de mejorar mi área de trabajo, es parte importante de mi trabajo					
32. Siempre estoy dispuesto a apoyar nuevas iniciativas que se propongan en la empresa					
33. Me siento capaz de desarrollar y participar en las actividades de MC de manera autónoma					
34. Tengo la tranquilidad de que si me atasco en alguna de las actividades de MC puedo pedir ayuda a otro compañero o a mis jefes/líderes directos					

35. Dispongo de manuales/documentación escrita de forma sencilla y visual que me ayuda a saber cómo realizar las actividades de MC					
36. Tengo la confianza de que dispondré del tiempo necesario para completar las actividades de mejora que me proponga					
37. Siento que la empresa fomenta y permite oportunidades reales de participar en las actividades de MC, proporcionándome los recursos (materiales, herramientas, información) y tiempo necesarios					
38. Siento que la empresa fomenta y me permite oportunidades reales de liderar actividades de MC en mi área de trabajo					
39. Siento que la empresa fomenta y me permite tomar decisiones relacionadas con la MC en mi área de trabajo					
40. Siento que existen dentro del sistema de MC suficientes actividades para recoger y analizar la opinión de todos los trabajadores acerca de las posibles oportunidades de mejora					
41. Participar en el sistema de MC me permite mejorar la productividad en mi área de trabajo					
42. Participar en el sistema de MC me ayuda a mejorar la calidad del trabajo realizado en mi área de trabajo					
43. Participar en el sistema de MC me ayuda a mejorar las condiciones (ergonomía, seguridad o medioambiente) en mi área de trabajo					
44. Participar en el sistema de MC contribuye a mi desarrollo profesional y personal					
45. Considero que las metodologías utilizadas para desarrollar las actividades de MC son claras y fáciles de entender					
46. Considero que es fácil aprender las metodologías necesarias para desarrollar las actividades de MC					
47. Considero que es fácil participar en las actividades de MC (no me requiere un esfuerzo mental y/o físico extra)					

Preguntas	1	2	3	4	5
48. Considero que existe un buen clima laboral en mi área de trabajo					
49. Siento que mis supervisores (jefes/líderes más cercanos) me muestran respeto y confianza, teniendo en cuenta mis opiniones y apreciando mi trabajo					
50. En general, me siento satisfecho con la organización del trabajo y asignación de responsabilidades en mi área de trabajo (individual y en equipo)					
51. Me siento parte de la Empresa y responsable de los procesos en los que participo					
52. En general, me siento satisfecho con las condiciones de mi puesto de trabajo (seguridad y salud ocupacional, confort físico, limpieza, orden)					
53. En general, me siento satisfecho con mis condiciones laborales (retribución, flexibilidad laboral, estabilidad laboral)					
54. Siento que mi trabajo me ayuda a realizarme como persona					
55. Mis jefes/supervisores ven como algo positivo que participe en las actividades de MC de mi área de trabajo					
56. La mayoría de mis compañeros de trabajo consideran como algo positivo participar en las actividades de MC del área de trabajo					
57. Las personas que me apoyan y asesoran en momentos difíciles (dentro y/o fuera del trabajo) consideran positivo que participe en las actividades de MC de mi área de trabajo					
58. Mis supervisores (jefes/líderes más cercanos) y demás compañeros me motivan a participar en las actividades de MC, a través de sus propios esfuerzos y comportamientos					

59. Si usted no participa de las actividades de mejora en la empresa, ¿podría por favor indicar las causas por las cuales no lo hace?:

_____

60. ¿Qué sugeriría para incrementar la participación?

_____

APPENDIX C – PUBLICATIONS AND PROJECTS

Journal Publications

- Jurburg D., Viles E., Tanco M. & Mateo R. (2016): What motivates employees to participate in continuous improvement activities?, Total Quality Management & Business Excellence, DOI: 10.1080/14783363.2016.1150170
  JCR: Q2
- Viles E., Jurburg D., Lleó A., Tanco M. & Mateo R. (2016) Diagnostic tool for assessing employee participation in continuous improvement, DYNA, 90 (3), 250
  JCR: Q4
- Jaca, C., Viles E., Jurburg D. & Tanco M. (2014). Do companies with greater deployment of participation systems use Visual Management more extensively? An exploratory study. International Journal of Production Research, 52(6), pp.1755–1770.
  JCR: Q2
- Jurburg D., Viles E., Jaca C. & Tanco M., (2015) "Why are companies still struggling to reach higher continuous improvement maturity levels? Empirical evidence from high performance companies", The TQM Journal, Vol. 27 Iss: 3, pp.316 – 327

SJR: Q2

Award: Highly Commended Paper in the 2016 Emerald Literati Network Awards for Excellence.

- Jurburg D., Viles E., Mateo R., Tanco M. & Lleó A. Understanding the determinants of employee participation in continuous improvement – Under review – major changes - International Journal of Operations and Production Management

  JCR: Q2

- Jurburg D., Viles E., Tanco M. & Mateo R. Continuous Improvement Leaders, Followers and Laggards: Understanding System Sustainability – Under review – major revisions - Total Quality Management & Business Excellence

  JCR: Q2

- Jurburg D., Tanco M., Viles E. & Mateo R. (2015) Employee participation: Key aspect in the success of Continuous Improvement Systems. Memoria investigaciones en Ingeniería, 13, 17-32
  Latindex
- Viles E., Jurburg D., Lleo A., Tanco M. & Mateo R. (2016) Design and validation of a questionnaire for analyzing the employees participation in continuous improvement . DYNA Management, vol. 3(1), 1-15. DOI: http://dx.doi.org/10.6036/MN7823
  Latindex

Conference Publications

- **Article Title:** Why is it that higher continuous improvement maturity levels are still not achieved? Empirical evidence in high performance companies

  Authors: Jurburg D., Viles E., Jaca C. & Tanco M.

  Conference Title: 7th International Working conference Total Quality Management - Advances and Intelligent approaches

  Place: Belgrado, Serbia, 2013

- **Article Title:** Measure to succeed: How to improve employee participation in continuous improvement

  Authors: Jurburg D., Viles E., Tanco M., Mateo R. & Lleó A.

  Conference Title: International Joint Conference - CIO-ICIEOM-IIE-AIM (IJC 2016)

  Place: San Sebastián, Spain, 2016

- **Article Title:** Strengthening Employees' Commitment to Continuous Improvement through Middle Managers' Behaviors

  Authors: Lleo A., Viles E., Jurburg D.

  Conference Title: 19th QMOD/ICQSS Conference

  Place: Rome, Italy, 2016

Projects

- **Title:** CIAM PLUS
  Funding agency: Diputación de Guipúzcoa
  Participant organization: Tecnun
  Duration: From 1/10/2015 to 30/06/2016
  Grant: 30.175 €
  Team leader: Elisabeth Viles
  Research team: Elisabeth Viles, Álvaro Lleó, Daniel jurburg