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**THE SOCIAL OUTCOMES OF KAIZEN
INITIATIVES IN HEALTHCARE**

By

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*To my Mother Elsa Marleni Suni Figueroa
and Comadre Isabel Machaca Huanca*

ABSTRACT

This thesis presents results from a field study that focuses on the social benefits of kaizen initiatives in healthcare context. Although human resources are recognised as the corner stone of kaizen initiatives, there has been few studies that address the social benefits of kaizen initiatives in healthcare so far. Additionally, most of these studies are theoretical, others are anecdotal and not based on robust empirical basis. To address this issue, a theoretical framework of kaizen initiatives was adapted to the healthcare context. Drawing on this input-process-outcome framework, it was distinguished determinants into input and process factors, and developed hypotheses related to the direct and indirect effects of the determinants on the social outcomes. These hypotheses were tested using data from 105 kaizen initiatives performed at two Italian public hospitals following a systematic regression analysis. The research found statistical significant support to the proposed hypotheses. Specifically, it was found that goal clarity, team autonomy and management support affect employee' kaizen capabilities and attitude whereas affective commitment to change only influences employee's kaizen capabilities and goal difficulty influences employees' attitude only. Moreover, support for mechanism that describe the indirect effect of input factors on social outcomes through the process factors was found. Namely, it was found that goal clarity, goal difficulty and management support affect both the social outcomes through affective commitment to change. Team autonomy affects both social outcomes through internal processes. Finally, goal clarity and team autonomy affect employee' kaizen capabilities through action orientation whereas this process factor mediates the effect of management support on the employees' attitude. Many of these findings confirm the scholar recommendations in lean healthcare literature and team effectiveness literature in healthcare. Furthermore, these findings will be valuable for lean healthcare practitioners who can invest the few resources available for the improvement of the healthcare service in developing effective *ad hoc* strategies that may guarantee the natural grow of the kaizen mentality of healthcare professionals, guaranteeing sustainable operational performance improvements.

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CHAPTER I: INTRODUCTION

1.1. Research motivation

Lean management is becoming the dominant paradigm to address efficiency and quality problems in many sectors through the adoption of kaizen initiatives, often referred as kaizen weeks/blitzes, A3-events or rapid improvement events (Clark et al., 2013). Particularly, these kaizen initiatives are performed by a multi-disciplinary team with the aim of improving a targeted work area or process within a timeframe. In healthcare, these kaizen initiatives are often led by teams of front-line workers to primarily improve operational aspects of target work area (Poksinska, 2010) using lean tools and concepts with small investments (Clark et al., 2013; Radnor et al., 2012; De Souza, 2009; Radnor and Walley, 2008; Ballé and Régnier, 2007).

Nevertheless, the many operational performance improvements (e.g., cost reduction, quality improvement) achieved due to the adoption of kaizen initiatives are not continued to be generated over the time. Radnor et al. (2012) highlight this issue and suggest that this is a consequence of the incorrect understanding of the kaizen approach by part of the healthcare professionals. The authors evidence that there is a lack of assessment of employee outcomes of a kaizen initiative although the lean literature agrees that both technical (i.e. operational aspects) and social system outcomes (i.e. improvement of employee's knowledge, skill and attitude) should be achieved to consider a lean initiative to be successful (Hong et al., 2014; Joosten et al., 2009).

To date, many public and private healthcare organizations adopt the kaizen initiatives within their work environment to improve the service for the end-consumers (patients), the organization and the employee outcomes (Gray et al., 2007). However, these lean healthcare applications focus primarily on improving operational aspects (e.g. time/cost reduction, quality improvement) disregarding the employee perspective which is widely recognised as the corner stone of lean initiatives (Drotz and Poksinska, 2014; Farris et al., 2009; Dahlgaard and Dahlgaard-Park, 2006). Therefore, it can be asserted that the non-evaluation of employee aspects may be the root cause of the unsustainability of operational

outcomes because these are consequences of the improvement of the problem-solving capabilities (Poksinska et al., 2016; Dickson et al., 2009), and the willingness to undertake improvement activities of healthcare workers (Tortorella et al., 2015; Sobek II and Smalley, 2008; Lee and Bruvold, 2003).

Additionally, many authors (e.g., Poksinska et al., 2016; Radnor et al., 2012; Mazzocato et al., 2010; Joosten et al., 2009) call for lean healthcare studies that extend beyond operational aspects to include these aforementioned employee aspects because they are strongly associated with the understanding and development of the kaizen mentality within an organization (Glover et al., 2013; Ballé and Régnier, 2007). For example, Holden (2011) argues that the evaluation of the effects of lean management on healthcare employee's outcomes are needed to really estimate the power and benefits of lean applications. Similarly, Ballé and Régnier (2007) suggests that the evaluation of human resource or employee capabilities are crucial during the evolution of the kaizen mentality in healthcare context. Therefore, it is undoubtedly needed to evaluate the social contributions of kaizen initiatives in order to complement the successful operational improvements published in lean healthcare literature.

So far, few studies (e.g. McIntosh et al., 2013; Holden, 2011; Poksinska, 2010; Young and McClean, 2008) argue that human resource benefits of kaizen initiatives involve improvements on waste recognition capabilities, more proactive behaviour to problem solving, and positive attitude toward the work environment of kaizen team members in the healthcare context. However, the current knowledge of social benefits of kaizen initiatives is based on theoretical studies that are based on previous research studies. Specifically, most of the lean healthcare literature focuses on describing details of the lean tools adoption, lean principle practices, singular kaizen initiative performance (e.g., De Souza and Pidd, 2011; Bahensky et al., 2005); and based on these kaizen experiences (e.g, Jimmerson et al., 2005), some guidelines are proposed for helping practitioners to accomplish successful social system outcomes however with almost no systematic or robust empirical evidence. Therefore, it is certainly needed to carried out an empirical research on this emerging field to benefit both the lean healthcare literature, because empirical evidence of social system will complement the technical ones, thus, the real

power of lean management in healthcare sector could be assessed; and the lean healthcare practitioners, because they will be provided with research-based guidelines to improve the social system outcomes which are crucial to develop the kaizen mentality within their organizations which will guarantee the continuous operational improvements.

1.2. Research questions

The general research question that addresses this research study is: What are the social benefits of the lean initiatives in healthcare? From these general questions, the following sub-questions emerge:

- How and why is the lean management implemented in healthcare?
- How is a lean initiative carried out in healthcare organizations?
- What kind of mechanisms are mostly adopted to perform lean initiatives in healthcare?
- Are the effects of these mechanism on the social systems of the healthcare organization empirically studied? What kind of social outcomes do continuous improvement initiatives yield in healthcare?
- What are the most determinant factors of social outcomes of kaizen initiatives in healthcare?
- How are the determinant factors related to social outcomes of kaizen initiatives in healthcare?

In order to tackle these research questions, this study using a field study approach and previous theory of lean healthcare and the improvement of the social system outcomes of healthcare organizations will systematically identify the social benefits of continuous improvement initiatives or kaizen initiatives in healthcare organizations.

1.3. Research purposes and objectives

The purpose of this study is twofold. First, this study aims to broaden the current lean healthcare theory, specifically, the extent of the knowledge of kaizen initiatives through understanding their effects on the employee capabilities and attitude outcomes because these social outcomes are suggested as determinant variables of the development of kaizen

mentality that guarantee the sustainability of the improvements. Second, this research aims to provide research-based guidelines to improve the social outcomes of kaizen initiatives to the lean healthcare practitioners. In order to achieve these purposes, it was established the following research objectives:

- To understand how and why the lean management is adopted in healthcare.
- To understand how the lean initiatives are carried out in healthcare.
- To understand the typology of mechanism adopted by healthcare employees to implement the lean management.
- To explain and the social benefits of the mechanism aimed to implement the lean management in healthcare.
- To explain which are the most determinant factors of social system outcomes and their relations to generate these social system outcomes.

1.4. Problem statement

Currently, the lean management is adopted by healthcare organizations to improve the recovery service for patients. This system is implemented using kaizen initiatives to resolve their quality and economic problems. However, the great improvements are not sustained due to healthcare employees may not correctly understand the kaizen approach. Indeed, some authors argue that most of the kaizen initiatives are addressed to only achieve improvements of the operational aspects, neglecting the social ones which are determinant of the kaizen mentality within healthcare organizations (Glover et al., 2013; Ballé and Régnier, 2007). The effects of kaizen initiatives on the social system (i.e. human resources and on their interactions) of healthcare organizations are rarely discussed (Drotz and Poksinska, 2014; Dahlgaard and Dahlgaard-Park, 2006) although some authors suggest that the success of lean initiatives (e.g. kaizen initiatives) depends on achieving both technical system outcomes (e.g. improvement of operation aspects) and social system outcomes (e.g. improvements of employee's knowledge, skill and attitude) (Hong et al., 2014; Joosten et al., 2009). In order to tackle the constant lack of assessment of social system outcomes of kaizen initiatives in healthcare context, a quantitative research study will be carried out through surveying workers of Italian healthcare organizations using a

previous tested model developed in the manufacturing sector. The data will be gathered to be analysed, and based on the findings, lean healthcare practitioners will be provided with information relating to how they may address the improvements of the social system outcomes. Likewise, based on the findings of this study, the lean healthcare literature will be extended as the effects of kaizen initiatives on the social system of healthcare organizations will be explained.

1.5. Sub-problems and outputs

In order to address the problem statement, the following sub-problems will be resolved to achieve the overall research objectives.

- Sub-Problem 1: To understand how and why the lean management is adopted in healthcare. This will be achieved through a literature review of the lean management implementation in healthcare.
- Sub-Problem 2: To understand how the continuous improvement initiatives are carried out in healthcare. This will be achieved through a literature review of the execution of continuous improvement initiatives in healthcare and based on site visit of hospitals in Italy. Furthermore, managers and key employees from the healthcare organizations will be interviewed.
- Sub-Problem 3: To understand the typology of kaizen mechanism adopted by healthcare employees during the continuous improvement initiative. This will be achieved through a literature review of kaizen mechanism. Specifically, the characteristics of the kaizen initiatives will be described.
- Sub-Problem 4: To explain the social outcomes of kaizen initiatives in healthcare. This sub-problem involves to review the theoretical and empirical research and anecdotal studies that address the effects of kaizen initiatives on the social system. Then, these social outcomes will be classified in terms of improvements of employee capabilities and the attitude of employees.
- Sub-Problem 5: To explain the management of the social outcomes and their predictors based on a previous tested model. A survey will be executed in Italian hospitals considering the measurement scales and items proposed by the study of

Farris et al. (2009). Furthermore, the relationships between input and process factors and social system outcomes will be assessed.

The following outputs will be achieved:

- Output 1: Documentation of how and why the lean management is implemented in healthcare. Specifically, the role of kaizen initiatives to generate economic and quality benefits during the lean management implementation in healthcare will be described.
- Output 2: Documentation of how the healthcare organizations address the execution of continuous improvement initiatives. Specifically, the strategy of implementation of the healthcare organizations involves in this study will be described.
- Output 3: Documentation of the characteristics of the common kaizen mechanism. Specifically, the characteristics and differences between kaizen mechanism (e.g., A3-reports and rapid improvement) will be described.
- Output 4: Documentation of the social outcomes reported by scientific papers and anecdotal reports. Moreover, the classification of the social outcomes of the continuous improvement initiatives according to improvements of employee capabilities and attitude will be documented.
- Output 5: Documentation of the determinant factors of social outcomes of a continuous improvement initiative in healthcare will be described. The statistically significant relationships between determinant factors and social outcomes will be described.

1.6. Research Model

In order to reach the purpose of broadening the lean healthcare literature and provided research-based guidelines for lean healthcare practitioners, a research model was established (See figure 1) to provide guidance and facilitate the research practices to achieve the objectives of the current research.

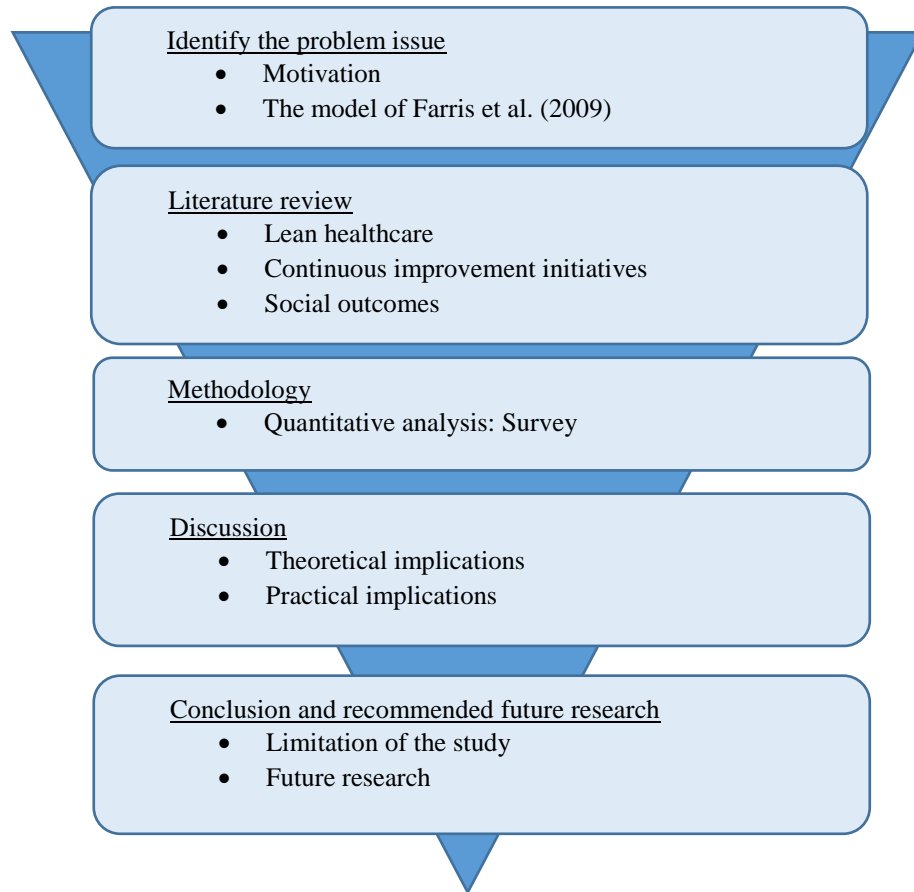


Figure 1: The research model which shows the main topics that are addressed in each chapter of this thesis.

The research model begins with the definition of the research issue (chapter 1) which is supported by the literature review of lean healthcare (chapter 2). The methodology to fill the research gap and the results analysis are described in chapter 3 and 4 respectively. Finally, the discussion of the findings is presented in chapter 5 and the conclusions and future research are explained in chapter 6.

Particularly, this study considers the model developed by Farris et al. (2009) to identify the most determinant factors of social outcomes and their relations due to among the few studies, that address the social aspects of continuous improvement initiatives (e.g., Holden, 2011; Lemieux-Charles and McGuire, 2006), the Farris et al.'s (2009) study provides a deep treatment of the topic and a successful attempt to resolve this neglected issue. In the following paragraphs this model is deeply described.

1.6.1. The model of social system outcomes of kaizen events

This study of Farris et al. (2009) develops a kaizen-social system model based on published studies on team effectiveness and kaizen events in the manufacturing sector (see figure 2). Based on the input-process-outcome framework, Farris et al. (2009) classified the social system outcomes in terms of employee capabilities (i.e., new knowledge and skills that team members adopted and may use in successive problem-solving tasks and attitude to be part and contribute actively during the kaizen events

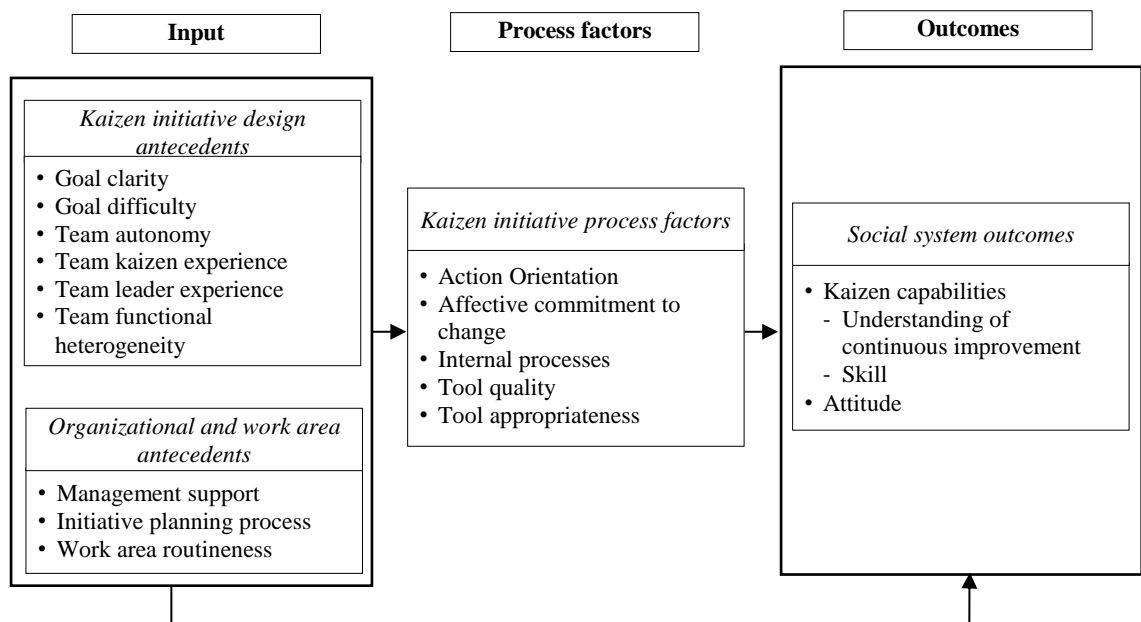


Figure 2: Theoretical model tested by Farris et al. (2009) to identify the social effects of kaizen initiatives

Afterward, the authors distinguish as the input factors those related to the design of the kaizen event (e.g., goal clarity and difficulty, kaizen experience of team members and cross-functional composition) and those related to the context of the event, such as time and other resources provided by the organization prior to the kaizen initiative (event planning process) and during its execution (management support); and the stability of the daily work activities (work area routineness). Furthermore, the authors classify as process factors those related to the variables ensuring effective teamwork during kaizen events,

such team focus on implementation rather than analysis (action orientation), team member buy-in for the goal of the event (affective commitment to change), quality of team coordination processes (internal processes), proper selection (tool appropriateness) and use (tool quality) of lean tools according to the kaizen event goal. Finally, the authors build a set of hypotheses on the factors that directly or indirectly determine the social system outcomes. Using data from 51 kaizen events in 6 manufacturing companies this study provides partial support for the theoretical model reported in figure 2.

1.7. Research hypotheses

To reach the objectives of this research, the following hypotheses will be investigated. These hypotheses were developed based on the current situation about the continuous improvement initiatives to implement the lean management implementation in healthcare and the call from many studies to examine why operational performance improvements are not continue to be generated in healthcare.

- Hypothesis 1: The practice of continuous improvement initiatives benefits the improvement of problem-solving capabilities and attitude of healthcare professionals.
- Hypothesis 2: The correct and effective implementation of the lean management in healthcare depends on the identification of determinant factors of the social outcomes and their relationships.
 - Hypothesis 2.1: Input factors are positively related to social outcomes.
 - Hypothesis 2.2: Process factors are positively related to social outcomes.
 - Hypothesis 2.3: Process factors mediate the effect between input factors and social outcomes.

1.8. Overview of research design and delimitations

As the achievement of the operational improvements depends on the employee outcomes, this study will systematically examine the theoretical model of Farris et al. (2009) for kaizen initiatives using a sample of 105 continuous improvement initiatives from an initial stage of the lean management implementation in two Italian public healthcare

organizations. In order to test the aforementioned working theory of kaizen initiatives, an empirical investigation based on a field study was chosen as it allows to accurately measure the social outcomes and the input factors and process factors of kaizen initiatives. In this way, this study demonstrates that social outcomes are also generated and are related to some input and process factors, thus, social outcomes should be also considered as a proxy of the kaizen team's effort during the lean management implementation. Additionally, this study will reemphasize the call from Lemieux-Charles and McGuire (2006), regarding the lack of research on team effectiveness outcomes in healthcare and the call to develop a strategy built on employee pull feedback (Keating et al., 1999), constant behaviour assessment and trust stakeholder commitment from McIntosh et al. (2013). Thus, it is a task of operation management community to help healthcare organizations to fill this team management gap.

Some delimitations of this research thesis must be underlined. First, this research considers only English peer-reviewed papers to conduct the literature review and mostly English theoretical and anecdotal studies to support the constructs of the model of Farris et al. (2009). The examination of non-English studies could shed light on relevant insights of the lean implementation in healthcare. Second, this study does not attempt to identify all social outcomes and their input and process factors of kaizen initiatives. The findings of this study only hold for the model of Farris et al. (2009) which were adapted to the healthcare context. Research on different social outcomes and their relationships with different input and process factors not-considered in this study could be the subject of future research. Third, the cross-sectional nature of our data which impedes to trace the improvement of kaizen social outcomes from one initiative to another. A longitudinal study could provide more insight on when, how and why kaizen teams yield better social outcomes. Fourth, this study has considered the continuous improvement initiatives of two Italian public hospitals. Future research may test the validity of the theoretical framework across a variety of context, such as including also private hospitals, hospitals in other countries to give a wider perspective on which determinants are crucial to yield kaizen social outcomes or healthcare organizations with longer experience (more than 5 years) in using continuous improvement initiatives to generalize the findings of this research. Finally, this study focuses only on the

assessment of social outcomes, future research could assess the relationship between the improvements of social outcomes and operational outcomes in the healthcare context in order to identify which determinant factors influence both technical and social outcomes of continuous improvement initiatives.

The reminder of this document is organized as follows, Chapter 2 provides a literature review of the current literature of lean healthcare considering papers published in scientific journals to build the working theory of kaizen initiatives. Chapter 3 describes the research methodology used to collect the data and test the hypotheses of the relationships between determinants and social outcomes. Chapter 4 presents the assessment of the hypothesis and the results. Chapter 5 presents the discussion of the findings and limitations and Chapter 6 presents the conclusions of this research study.

CHAPTER II: LITERATURE REVIEW

The following chapter reviews the body of knowledge of lean healthcare to understand the role of social outcomes or employee outcomes of kaizen initiatives during the lean management implementation in healthcare. In this way, a working theory of kaizen initiatives will be built to associate the social outcomes with the sustainability of the improvements of technical outcomes, i.e. operational improvements, in healthcare. In the following sections, the state of art of lean healthcare will be described through the analysis of research papers published in different scientific journals.

2.1. Lean initiative outcomes in healthcare

Lean management has been implemented in many public and private healthcare organizations to resolve their economic and quality issues. By adopting a systematic implementation approach, called as kaizen, healthcare organizations embed the lean management practices which allow to achieve well-proven operational benefits with small investments (Clark et al., 2013; Radnor et al., 2012; De Souza, 2009; Radnor and Walley, 2008; Ballé and Régnier, 2007).

The kaizen philosophy is adopted through ever-repeating processes (Radnor et al., 2012) that are structured in kaizen initiatives often referred as kaizen weeks/blitzes, A3-events and rapid improvement events (Clark et al., 2013). These kaizen initiatives aim to turn people into problem solvers who take ownership of improvement activities and work every day to streamline a process (Poksinska et al., 2016; Drotz and Poksinska, 2014; Ballé and Régnier, 2007). Particularly, it is created a multidisciplinary team of front-line workers who mentored using problem-solving tools and coached to continuously develop improvement ideas through practical experimentation at the site of the work (Poksinska, 2010; Kim et al., 2009). Specifically, these human resources are provided with learning activities to improve their skills, knowledge and attitude (Lee and Bruvold, 2003) in order to develop the needed capabilities and enthusiasm that contribute to improve continuously the level of kaizen mentality (Ballé and Régnier, 2007). In this way, employees take an active role in the kaizen initiatives, as they detect problems and waste, suggest the execution of improvement initiatives and lead these improvement initiatives in a given

timeframe (Drotz and Poksinska, 2014; Liker, 2004). The Poksinska's (2010) study proposes that the outcomes of a lean initiatives, as kaizen initiatives, can be classified in two types in healthcare. The performance outcomes or technical outcomes that are stated in numbers or given as improvement rates (e.g. shortened treatment time, reduced waiting time, increased patient throughput) and the employee development outcomes or social outcomes that are related to the employee's ability to recognize wastes and the proactive attitude to resolve problems

This classification is in line with the study of Farris et al. (2009). The authors argue that lean initiatives, as kaizen initiatives, can be studied using the socio-technical system. According to the socio-technical system (STS) theory, "every organization is made up of people (the social system) using tools, techniques and knowledge (the technical system) to produce goods or services valued by customers (part of the organization's external environment)" (Liu et al., 2006, p. 521). Additionally, Pasmore (1988) argues that the extent to which the social and technical systems fit one another, and fit the demands of the external environment, greatly determines the organization effectiveness (see figure 3). Furthermore, Liu et al. (2006) discover within the STS theory that organizational objectives are best achieved through the joint optimization of the technical and the social aspects of an organization, and organizational design should match the external environment requirements.

Based on the socio-technical system (see figure 3), the technical system encompasses basically "the tools, techniques, devices, artefacts, methods, configurations, procedures and knowledge used by organizational members to acquire inputs, transform inputs into outputs and provide outputs or services to clients or customers" (Pasmore (1988), pp. 55-56). In contrast, the social system consists of "the people who work in the organization and all that is human about their presence" (Pasmore (1988), p. 25); particularly, how people feel and respond and how the social interactions are between themselves (Hong et al., 2014).

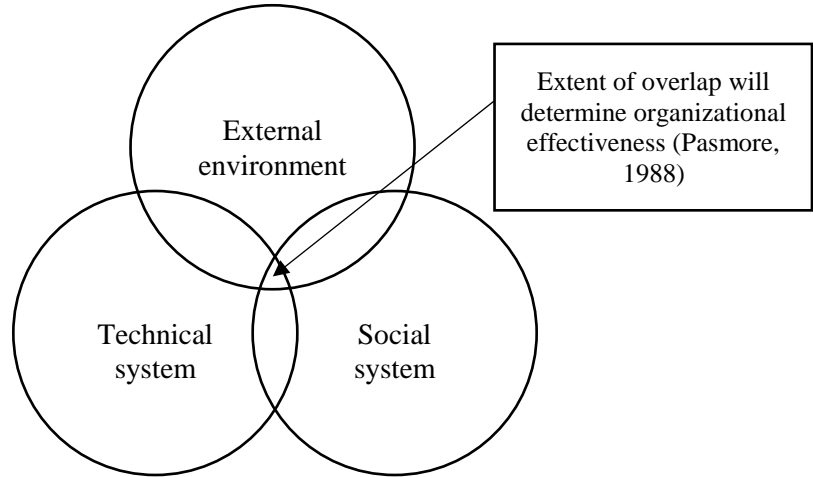


Figure 3: The socio-technical system theory (Hong et al. 2014).

Considering the typology of lean initiative outcomes proposed by Poksinska (2010) which is supported by Farris et al. (2009), it can be argued that lean initiatives, apart from generating operational improvement outcomes (i.e., technical system outcomes, hereinafter technical outcomes), generate also social system outcomes (hereinafter, social outcomes). Nevertheless, the effects of lean initiatives on employee's outcomes are barely evaluated (Holden, 2011). Therefore, the aim of this chapter is to explain the current state of the effects of lean initiatives on human resources outcomes.

2.2. Review methodology

A systematic literature review was conducted to explain the effects of kaizen initiatives on healthcare professionals. Papers published in peer-reviewed journals were selected by exploring the following electronic databases: Scopus and Google scholar. The research of these papers was conducted using the following keywords: Lean healthcare, lean hospitals, kaizen hospitals, lean Management in hospitals, Lean thinking in Hospitals. Additionally, only articles that were published in English language were included.

To address this literature review process, the papers were classified according to five parameters: research method and year, also considered by De Souza (2009), healthcare area, also considered by Mazzocato et al. (2010), lean healthcare initiatives, continuous practice of kaizen issues and lean initiative outcomes. These parameters are:

- (1) Research method and year: the studies on lean healthcare were classified according to the research methods that were considered to demonstrate their contributions. The following methods were considered:

Theoretical studies: studies that use a scientific method to build theory, such as literature review and conceptual development.

Empirical studies: studies that uses multiple methods for data collection from companies or from individuals, such as case studies and surveys (Yin, 2008).

Practice studies: this criterion aimed to identified that papers that focus on demonstrating whether the lean management can be successfully implemented in healthcare. Benbasat et al. (1987) distinguish between case study research and practitioner applications by noting that the latter informally detail the author's experiences in a project and typically conclude with a set of "do's and don'ts."

- (2) Healthcare area: the studies were assorted according to the healthcare areas where the kaizen initiatives were performed (e.g., specific healthcare units, hospital, healthcare system, specific healthcare process to recover a kind of patient).
- (3) Lean healthcare initiative: the studies on healthcare were classified considering whether or not the lean initiative was carried out according to kaizen initiatives (e.g., A3 reports, kaizen blitz, rapid improvement events, lean implementation).
- (4) Continuous practice of kaizen initiatives: this criterion aimed to verify whether the continuous practice of the kaizen initiatives outcomes is considered in the revised papers (yes) or not (no).
- (5) Lean initiative outcomes: the studies were classified according to the typology of outcomes that are reported in terms of technical outcomes (e.g., reduction of time, cost and errors) and social outcomes (e.g., improve of knowledge, skills and attitude).

Following the selection criteria, 81 papers were initially selected as potentially relevant contributions. Then, through a rigorous selection, 55 were removed because they did not meet the inclusion criteria. Therefore, 26 studies were considered to create a spreadsheet in Excel which formed the database of the literature review findings. Detailed list of eligible peer review articles is reported in table 1.

Table 1: Detailed list of considered peer review articles

First author's last name, year of publication	Research methodology	Health care context	Type of improvement initiative	Lean initiative outcomes		Continuous practice
				Technical outcome	Social outcome	
Bahensky et al. (2005)	Empirical	Healthcare unit (Radiology CT scanning)	Kaizen event	Reduce cycle time and defects	Team dynamics and create improvement ideas and team autonomy	No
Al-Balushi et al. (2014)	Theoretical	Healthcare process	Lean implementation	--	Attitude	No
Dickson et al. (2009)	Empirical	Healthcare unit (Emergency department)	Kaizen event	Patient visits increased by 9.23%. Length of stay was reduced without raising cost per patient	Generate better improvement ideas More enthusiastically staff	No
Jimmerson et al. (2005)	Empirical	Healthcare unit (Anatomy pathology laboratory)	A3 report	Reduce waiting time Save money	Eager to make changes	No
Ghosh and Sobek II (2015)	Empirical	Hospital	A3 report	--	Development of new knowledge to guarantee the sustainability of the improvements	Yes
Laureani et al. (2013)	Empirical	Hospital	Lean implementation	Lean yielded practical benefit to the hospital	--	No
Poksinska (2010)	Theoretical	Hospital	Lean implementation	Time	Waste recognition and more proactive attitude	No
Clark et al. (2013)	Theoretical	Healthcare unit (Laboratory medicine)	Lean implementation	Quality and Cost	Knowledge of improvement methodology	No
Atkinson and Mukaetova-Ladinska (2012)	Practice	Hospital	Kaizen event	Time/Quality	--	No

Table 1: Continued

First author's last name, year of publication	Research methodology	Health care context	Type of improvement initiative	Lean initiative outcomes		Continuous practice
				Technical outcome	Social outcome	
Visich et al. (2010)	Empirical	Hospital	A3 report	Reduce waiting time	New Skills, learning experience, ability to identify problems	No
Radnor et al. (2012)	Empirical	Healthcare system	Kaizen event	Time	--	No
Holden et al. (2011)	Theoretical	Healthcare unit (Emergency department)	Kaizen event	Time	Staff are satisfied with their job and less likely to leave, and faced lower workloads	No
Zeng and Zhang (2014)	Empirical	Healthcare process	A3 report	Quality/improvement of the service /improvement of the service	--	No
Bassuk and Washington (2013)	Practice	Hospital	A3 report	--	Staff problem-solving capabilities consistent with the A3 Thinking.	No
Aij et al. (2013)	Empirical	Hospital	Lean implementation	--	Personal and professional skills	No
McDermott et al. (2013)	Practice	Healthcare unit (Diabetes day centre)	Kaizen event	Time/ reduce patient journey time	--	No
De Souza (2009)	Theoretical	Healthcare system	Lean implementation	Reduction of waiting time and delays	--	No
Shazali et al. (2013)	Theoretical	Healthcare system	Lean implementation	Cost effectiveness; more productive	Attitude to problem solving; employee can reduce stress and increased their morale	No

Table 1: Continued

First author's last name, year of publication	Research methodology	Health care context	Type of improvement initiative	Lean initiative outcomes		Continuous practice
				Technical outcome	Social outcome	
Eitel et al. (2010)	Theoretical	Healthcare unit (Emergency department)	Lean implementation	Time/Quality	--	No
Kinder and Burgoyne (2013)	Theoretical	Hospital	kaizen event	Performance improvements	--	Yes
Al-Araidah et al. (2010)	Practice	Healthcare unit (Pharmacy area)	Kaizen initiatives	Savings of 45% in the drug dispensing cycle time	--	No
Fillingham (2007)	Theoretical	Hospital	Kaizen event	Reduction of waiting time and cost; improvement of quality in the trauma pathway	--	No
Carter et al. (2012)	Practice	Healthcare unit (Emergency department)	A3 report	Reduction of waiting time.	--	No
De Souza and Pidd (2011)	Theoretical	Healthcare system	Kaizen event	The waiting time was reduced to 8 weeks.	Staff morale much higher	No
Smith et al. (2012)	Empirical	Healthcare process	Kaizen event	4% growth in the number of patients served	Staff morale	No
Kimsey (2010)	Practice	Healthcare unit (The sterile process unit)	A3 report	The cost of non-preventive maintenance decreased from 12000 to 3600 per month	--	Yes

2.3. Literature review findings

Based on the accepted studies, it was found that most of the studies focuses mainly on testing and reporting the successful operational improvements that were achieved by

adopting the lean approach (e.g., reduce waiting time, quality improvements reduction of patient journey time, save generated for the hospital, reduction of clinical errors) (See figure 4). However, few studies evaluate the effects of lean implementation on healthcare professionals. Among the accepted studies, the 85% of the studies reported performance outcomes and more than the half reported only technical outcomes. Most of these studies reported improvements related to reduction of the waiting time of patients (e.g., Carter et al., 2012; Radnor et al., 2012; Visich et al., 2010; Bahensky et al., 2005), quality improvements (e.g., Zeng and Zhang, 2014; Clark et al., 2013; Atkinson and Mukaetova-Ladinska, 2011) and cost reduction (e.g., Shazali et al., 2013; Kimsey, 2010; Jimmerson et al., 2005)

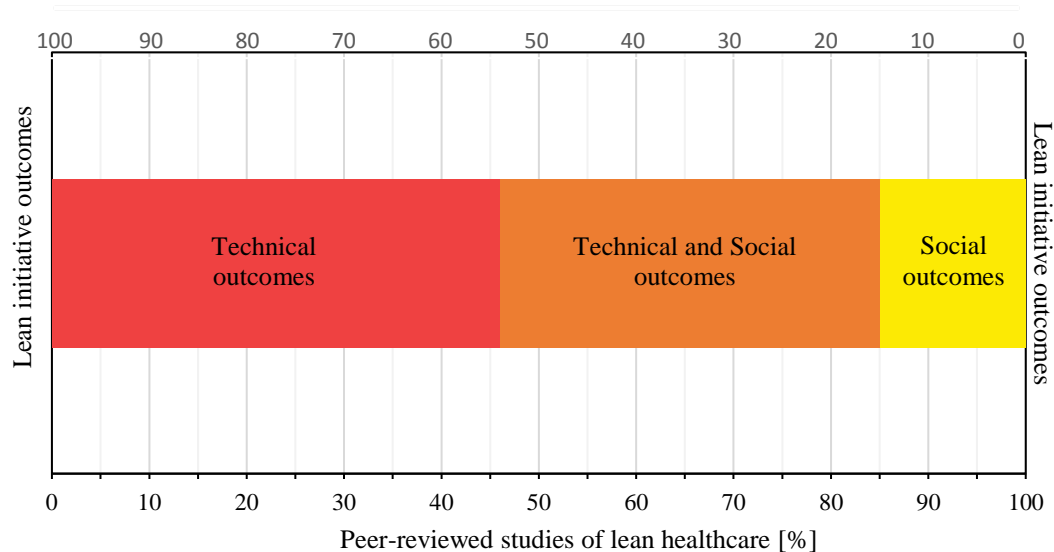


Figure 4: The body of lean healthcare literature divided according to the type of outcomes

On the other hand, the 54% of the studies reported employees' outcomes and only 15% reported these social outcomes. Among these studies, the employees' outcomes that are often mentioned are: the improvement of the employees' attitude (e.g., Al-Balushi et al., 2014; Shazali et al., 2013; Holden et al., 2011; Poksinska, 2010; Jimmerson et al., 2005), improvement of skills and generation of ideas (e.g., Ghosh and Sobek II, 2015; Aij et al., 2013; Bassuk and Washington, 2013; Poksinska, 2010; Visich et al., 2010; Dickson et al., 2009). In addition, the 39% of the studies reported both type of outcomes. Particularly, the Holden's (2011) study reveals that lean initiatives, as kaizen initiatives, generates social

improvements referred as a better attitude of healthcare workers improving their quality of work life. Similarly, the study of Visich et al. (2010) indicates that kaizen initiatives increase the skills and knowledge of healthcare workers. It can be argued that wastes are reduced due to the improvement of employees' problem solving capabilities and attitude). This is supported by some scholars (e.g., Poksinska, 2010; Holden, 2011) that suggest that employee outcomes (e.g., the waste recognition capabilities, the more proactive behaviour to problem solving, and the positive attitude toward the work environment of healthcare workers), are improved or enhanced after lean initiatives.

Additionally, it was found that many scholars are mainly studying the benefits of lean management implementation in healthcare using different research methods to generate empirical findings, develop new theories and demonstrate that lean concepts and tools can be used in healthcare. Specifically, among the accepted studies that reported technical outcomes (i.e., the 85% of the total accepted studies), 36% are empirical studies, 41% are theoretical studies and 23% are studies that reported the feasibility of implementing lean initiatives but without a robust methodology (see figure 5). Furthermore, considering the studies that addressed the social outcomes of lean initiatives (i.e., the 54% of the total studies), it was found that 50% of these studies are empirical ones, 43% are theoretical studies and just 7% are studies that did not follow any systematic research approach to support their findings.

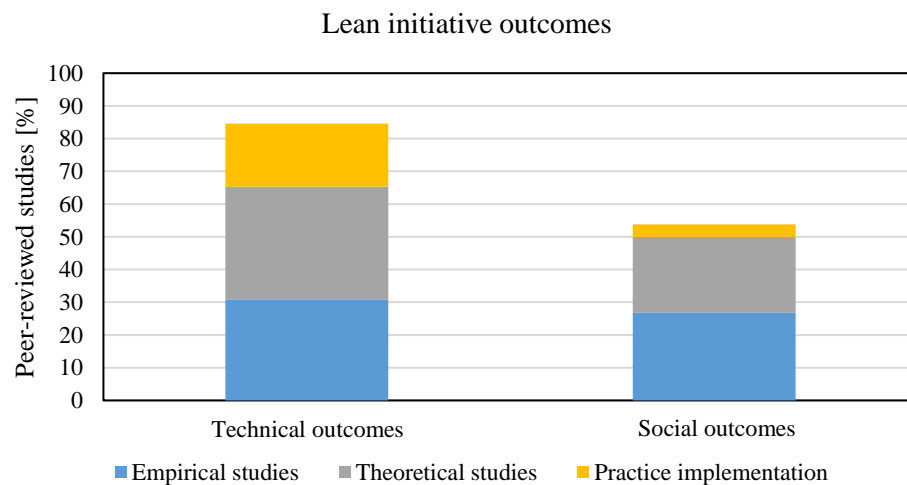


Figure 5: Technical and social outcomes of lean initiatives in healthcare of published studies

Based on the above findings, it can be argued that the lean management implementation in healthcare context generate both technical and social outcomes. However, most of the studies continue focusing on demonstrating the operational performance benefits of lean initiatives, neglecting the social outcomes although many scholars (e.g., Holden, 2011; Joosten et al., 2009) argue that a lean initiative is successful whether both outcomes are generated. It can be argued that the evaluation of the social outcomes of lean initiatives that follow the kaizen approach can be seen as a further development of the way how the lean initiatives are carried out.

Moreover, considering the accepted studies, it can be asserted that the lean management is mostly implemented using structured initiatives such as A3 reports, kaizen event or kaizen project. Indeed, 61% of the total number of studies reported technical outcomes using kaizen initiatives. Rather, 35% of these studies reported social outcomes (see figure 6).

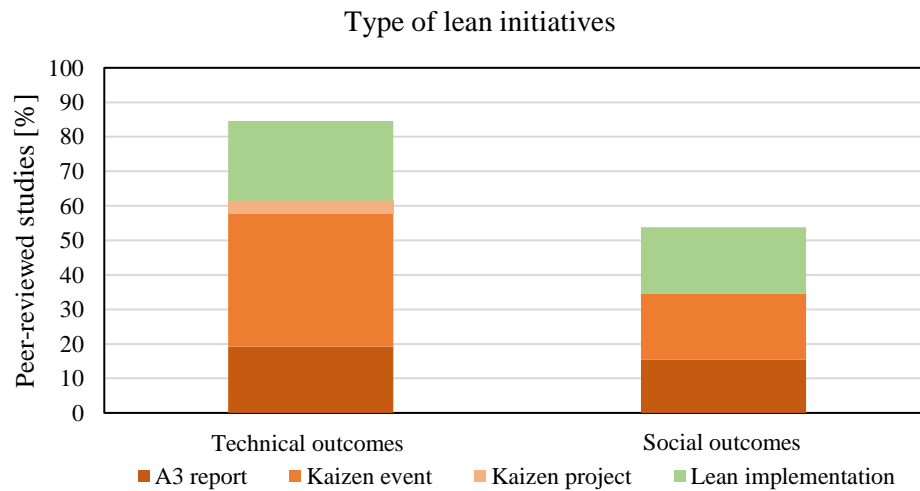


Figure 6: Lean healthcare outcomes of the mechanism to implement the lean management in healthcare

Specifically, the kaizen event and the A3 reports are the most used mechanism in healthcare to conduct the lean management implementation. Additionally, it was noticed that 23% of the studies that reported technical outcomes and the 19% of the studies that reported social outcomes are characterized by not following any structured initiative as kaizen initiatives.

Besides, it was found that the lean management approach is mainly implemented within specific healthcare units. Indeed, 38% of the studies (e.g., Dickson et al., 2009; Bahensky et al., 2005; Jimmerson et al., 2005; Clark et al., 2013) reported technical outcomes whereas 19% of the studies (e.g., Aij et al., 2013; Bassuk and Washington, 2013; De Souza and Pidd, 2011) reported social outcomes in healthcare units such as: laboratory unit, emergency department, radiology CT scanning.

On the other hand, only 23% of the studies explained the lean management implementation across the all healthcare organization, i.e., hospitals. Interestingly, the 15% of these studies explain the lean management implementation across the healthcare system within a big context and involving more than one healthcare organization (e.g., national healthcare system). See figure 7.

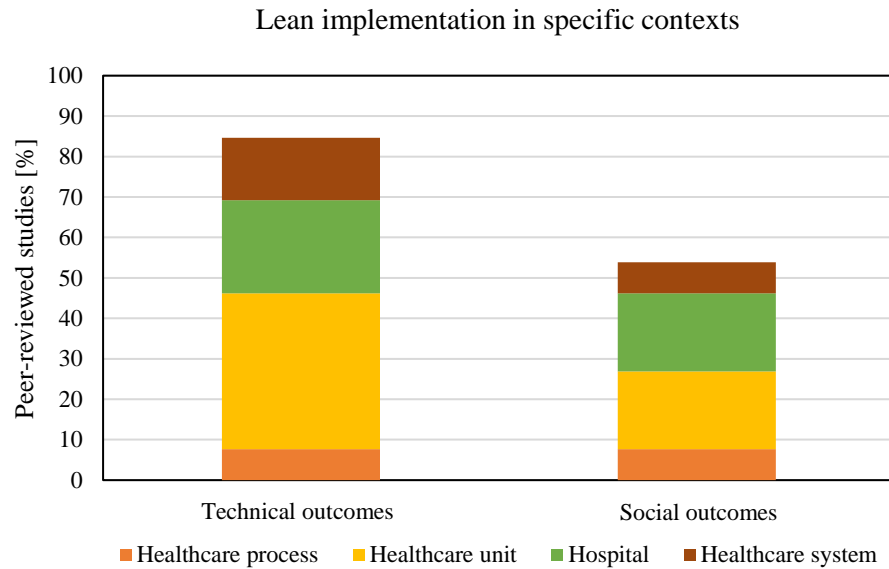


Figure 7: Lean healthcare outcomes of the initiatives performed within healthcare contexts

In respect to the social outcomes of lean initiatives performed in healthcare context, it was found that 19% of the studies report social outcomes of lean initiative that was conducted in specific units of healthcare organizations. This shared is similar for the case lean initiatives that were performed across the hospitals. In case of specific healthcare process and healthcare system, it was found the only 7% of the studies for each case focused on these types of context.

Finally, among all accepted studies, it was found that only 3 out of 26 studies (Ghosh and Sobek II, 2015; Kinder and Burgoyne, 2013; Kimsey, 2010) discuss about the continuous practice of lean initiatives. The rest of the studies focus only on remarking the benefits of a singular lean initiative.

2.4. The current state of the social effects of lean initiatives in healthcare

Based on the above findings, it can be argued that the lean initiatives are mainly adopted to address economic and quality issues, i.e., technical outcomes, to match better the demands of healthcare service. Specifically, the kaizen initiatives are mainly conducted using the mechanisms: kaizen event and A3 reports. However, few studies (e.g., Ghosh and Sobek II, 2015; Al-Balushi et al., 2014; Kinder and Burgoyne, 2013; Kimsey, 2010) were only concerned with the social outcomes of these kaizen initiatives in healthcare. This is supported by some scholar (e.g., Drotz and Poksinska, 2014; Farris et al., 2009; Dahlgaard and Dahlgaard-Park, 2006) who argue that the employee perspective or employee outcomes, which is widely recognised as the corner stone of lean implementations, is often disregarded although human resources are who adopt the problem-solving capabilities and execute the improvement activities to reduce wastes in a process (Poksinska et al., 2016; Dickson et al., 2009). Similarly, many scholars (e.g., Joosten et al., 2009; Sawhney and Chanson, 2005; Sheridan, 1997) asserted that assessment of the effects of the kaizen initiatives on the employee outcomes is just a formal target which evidence the necessity to perform research studies in this emerging field.

Current studies of kaizen initiatives do not discount these theories, but simply build on them to continue demonstrating that kaizen initiatives help to improve operational aspects of healthcare organizations although the lean literature suggests that improvements in both technical and social system outcomes should be achieved to consider a kaizen initiative be successful (Hong et al., 2014). For example, the empirical study of Drotz and Poksinska (2014) examines three management implementations in Swedish healthcare organizations. The authors concluded that the implementation initiatives of lean management increases either the employees' skills and enhance their motivation because employees declare that

they felt respected and valued, however, the authors did not specify whether or not these initiatives were carried out using kaizen initiatives.

Interestingly, few studies have addressed the social outcomes of kaizen initiatives by also suggesting some determinant factors, e.g., management support, team composition, goal definition, that are likely to affect social outcomes (e.g., Al-Balushi et al., 2014; Holden, 2011). These authors provide guidelines related to task definition, team composition and process factors. However, most of these guidelines were not systematically assessed and are reported as conclusions of practitioner or theoretical studies based on secondary data (Holden, 2011; Joosten et al., 2009). There is an absent of empirical research (Holden, 2011). It can be argued that a systematic analysis of the significant effect of these predictors on the social outcomes of kaizen initiatives in healthcare is needed. To address this type of emergent issue in healthcare, some scholars (e.g., Lemieux-Charles and McGuire, 2006; Devine, 2002; Sundstrom et al., 2000) suggest to adopt models from other sectors (e.g., the model Farris et al., 2009) to study this specific phenomenon.

The theoretical implication of the assessment of the social outcomes will be the explanation of the role of human resources in the kaizen initiatives, increasing the body of knowledge of lean healthcare. Additionally, in terms of managerial implications, the evaluation of social outcomes may provide insights into the peculiarities of kaizen initiatives that would be considered to activate mechanism that guarantees social outcomes, thus, constant operational performance outcomes. This will be useful for lean healthcare practitioners who will focus on develop effective strategies that guarantee the trust adoption of the kaizen approach within their work area.

CHAPTER III: RESEARCH METHOD

In this chapter, it is provided the information related to the research strategy to pursuit the goals of this study. First, the details of research methodologies in operations management are described to aimed to select one of them to conduct this study. Second, based on this selection, the research design will be developed by defining: the conceptual framework, the type of research design (including the sample and the planning of the data collection process), the data analysis procedure to test the reliability and validity of the constructs and to support the aggregation. Specifically, the data collection and data analysis the support the validity of the measurement scales are provided in this chapter, while the statistical analysis to test the significance of the hypothesised relationships are provided in the following chapter.

3.1. Review of research methodology in operations management

Many research methodologies (e.g., case studies, survey research, action research) have been identified in operations management to address empirical research to connect operations management academics to practitioners (Yin, 2008; Meredith et al., 1989). These research approaches aimed to set up a strong foundation in gathering and using empirical data to correctly answering the research questions. Therefore, the selection of the research approach is crucial to guarantee the reliability and validity of the results and conclusions.

Since the early 1980s, many scholars (e.g., Filippini, 1997; Flynn et al., 1990; Meredith et al., 1989) suggest and call for the execution of more empirical studies in response to the over-reliance on theoretical studies in operations management (Barratt et al., 2011). Indeed, the authors argue that theoretical studies describe abstract application of techniques which are of little use to operations managers (Filippini, 1997). To response this claim and based the purpose of this research, i.e., test a previous theory, the empirical methodologies (See table 2) were only considered, as these are characterized by following a rationale for the application of specific procedures and techniques to identify, gather and analyse data to answer the specific research questions (Moody, 2002; Yin, 2008). These empirical methods

can be distinguished according to the type of data that is collected in terms of words or numbers utilizing opened or closed ended questions (Creswell, 2003). These methods are:

- Qualitative research methods
- Quantitative research methods

Qualitative research methods aim to collect qualitative data, i.e. words, using opened-ended questions during interviews, considering observations and documentary proofs which will be later analysed using qualitative data analysis methods (Creswell, 2003). Often these empirical methodologies tend to be more suitable for the early stages of research (exploratory research) and for theory building. Additionally, qualitative methods tend to be applied more easily in real world settings, but lack internal validity (alternative explanations of results; lack of control) and external validity (usually concerned with a single case: limits generalisability to other settings). In addition, interpretation of data is by nature much more subjective than quantitative methods because it is easy to recognise what the study will demonstrate using the collected data (Moody, 2002). The most common qualitative methods are: case study and action research and archival analysis

Quantitative methods focus on collecting numerical data using commonly closed-ended questions (Creswell, 2003) which will be then examined using statistical methods. These empirical methodologies tend to be more suitable to test and refine a well-developed theory. Although the quantitative methods tend to provide more convincing scientific evidence, their application in a real-world context (field setting) is generally more difficult (Moody, 2002). The most common quantitative methods are: experiment, survey and historical data.

In Table 2, the empirical methodologies are classified according to typology of data collected and the classification of methods proposed by Yin (2008). Besides, although the action research was not considered by Yin (2008), it was added to this classification because this empirical method matches the criterion established by Yin (2008). The characteristics of action research are described deeply in section 3.1.2

Table 2: Empirical research methods (Adapted from Yin, 2008)

Empirical methodology	Method	Form of research question	Requires control of behaviour events?	Focusses contemporary events?
Quantitative	Experiment	How, why?	Yes	Yes
	Survey	Who, what, where, how many, how much?	No	Yes
	History	How, why?	No	No
Qualitative	Archival analysis	Who, what, where, how many, how much?	No	Yes/No
	Case study	How, why?	No	Yes
	Action research	How?	Yes	Yes

In order to select the suitable empirical method to answer the research questions, the characteristics of the empirical methodologies and their advantages and disadvantages will be described in the following sections. Basically, the three conditions established by Yin (2008) will be considered to describe each one in the following sections. These conditions are:

- The type of research question;
- The control an investigator has over actual behavioural events;
- The focus on contemporary as opposed to historical phenomena.

3.1.1. Case study

Case study research is an empirical research approach that focuses on understanding the dynamics, operations and practices present within events or series of related events that happen in single or multiple settings using an array of data collection procedures (Yin, 2008; Creswell, 2003; Flynn, 1990; Eisenhardt, 1989).

Specifically, this strategy consists on collecting data from the actors that are involved in a contemporary, specific and complex phenomenon or mechanisms that generate quality and cost benefits to an organization (Yin, 2008; Amaratunga and Baldry, 2001; Meredith, 1998). In such a way, this empirical methodology is commonly used when “how” or “why” research questions are being posed to provide new insights (Yin, 2008; Meredith, 1998), descriptions (Kidder, 1982) and to test theory (Anderson, 1983), or generate theory

(Gersick, 1988) related to unknown mechanisms that finally benefit practitioners due to the high validity of the breakthroughs.

Indeed, many of the breakthrough concepts and theories in operation management (e.g., lean production) have been developed through the case study approach, as this strategy reveals the creative insights of people at all levels of organizations when they address and resolve daily problems within different contexts. Voss et al. (2002) argue that these new ideas are developed by those who are working in close contact with multiple case studies-management consultants, not by distant consultants. Additionally, the case study has been used to assess the behaviour of dependent variables, to provide counter-examples to prior hypotheses, to investigate established areas where contradictions have arisen, and even to allow analysis without variables (Meredith et al., 1989).

Furthermore, a very important advantage of the case study approach lies in the richness of the phenomenon details that are captured by the observer-researcher, as he is completely immersed in this event in its natural setting without any control over the event (Yin, 2008; Meredith, 1998). Although neither the independent nor intervening variables are controlled and the researcher may not even know what the dependent variables are, various outcomes and processes are measured extensively and systematically through multiple sources of data (Meredith et al., 1989). That is why the case study approach is preferred in evaluating behaviours issues that happen within contemporary events (Yin, 2008) which also allows investigators to develop their knowledge about the process or phenomena under investigation, thus, gaining a holistic understanding of the phenomena in its natural setting to directly generate theories (Creswell, 2003; Yin, 2008; Moody, 2002; Meredith et al., 1989). This situation distinguishes and makes case studies appropriate for the exploratory phase of an investigation (Yin, 2008).

However, the case study approach is characterized by being: first, it is a time-consuming methodology which restricts to thoroughly study a single or few cases; second, it depends on skilled interviewers to obtain high quality data which may add bias; and third, care is needed in drawing generalizable conclusions from a limited set of cases and in ensuring rigorous research (Creswell, 2003; Voss et al., 2002). These limitations hinder the

possibility to generalise findings as it is rather difficult to find similar cases (Amaratunga and Baldry, 2001) to test the external validity (Berger, 1983). Indeed, case studies deal with unique situations and, because of that, it is not possible to elaborate detailed and direct comparisons of data. To overcome this limitation, multiple case studies is regarded as more robust approach as the generalization of a theory is related to the complexity of external validity (Amaratunga and Baldry, 2001)

Additionally, the case study method is criticized due to its lack of rigour and an excess of bias. This last limitation is maybe the most critical one of the case study approach (Yin, 2008) because the use of “subjective” judgements of the researchers during the data collection stages can render constructs invalid and inferences characterised by a lack of reliability (Becker, 1986). Finally, like all experimental observations, case study results can be generalised to theoretical propositions (analytical generalisation) but not to populations or universes (statistical generalisation). Thus, the aim of case studies cannot be to infer global findings from a sample to a population, but rather to understand and articulate patterns and reveals new theoretical linkages (Amaratunga and Baldry, 2001).

3.1.2. Action research

Action research is an empirical method that is conducted in close association with the practical application of a research idea to solve a problem (Coughlan and Coughlan, 2002). By following this research approach, two outcomes are achieved: an action and a research outcome, unlike typical research strategies that aim to create knowledge only (Coughlan and Brannick, 2014; Elden and Chisholm, 1993). Additionally, this empirical method is appropriate when “how” question is posed, as this approach aims to describe and understand actions and creating knowledge or theory about that actions as the action unfolds. Some authors (e.g., Robson, 2002; Kemmis and McTaggart, 1988) argue that action research is appropriate for trying new ideas aimed to improve practices within a context. This is support by Gomm and Davies (2000) who argue that the action research can be an effective form of feasibility study as it allows to evaluate a change while it is happening.

During the performance of an action research study, the procedures, barriers and resulting decisions are described thoroughly so the reader can continuously compare research theory (e.g., freezing, boundary spanning) with the activities occurring in the firm (Meredith, 1989). The main advantage of this method, particularly for operations, is the immediacy of the results and their relevance to the organization's situation.

Two other key features of action research are: the series of episodes structured in a cyclical process to collect data and the partnership and co-operation of the researcher and practitioners to execute the problem-solving plan (Casey, 2007; Coughlan and Coughlan, 2002; Waterman et al., 2001). However, it does not always mean that the researcher and research participant work together in designing the research: it may happen, but it is not essential (Huxham and Vangen, 2003). This is another peculiarity of the action research approach that differs this research strategy to other ones. Although the researcher is involved within the resolution of the problem to collect data (Moody, 2002; Meredith, 1989), the researcher may be a participative practitioner or a facilitative trigger (Melrose, 2001). Therefore, it cannot be argued that the researcher is able to control the variables.

Nevertheless, this research approach is usually associated with small-scale studies, most of the studies are restricted to a single organization, making difficult the generalization of the findings to other organizations. Moreover, there is a high probability of lack of impartiality on the part of the researcher, as researchers may attempt to influence the situation in a positive direction while collecting data and observing the dependent variables. Therefore, the personal ethics of the researcher plays a crucial role to shape and tell the true story of what has taken place and how it is understood, rather than a biased version. Finally, action research is often under criticism because it is considered a “consulting masquerading as research” due to the similarities between consultancy and action research (Coughlan and Coughlan, 2002).

3.1.3. Experimentation

The experiment approach is associated with the traditional scientific method, as the investigator can handle independent variables of a context and systematically observes the resulting change (Flynn, 1990; Stone, 1978). A reason to conduct this kind of study lies on

fact that some research questions cannot be addressed by existing research methodologies to collect data (Gupta et al., 2006). In such situations, investigators are constrained to collect primary data using experiments in a controlled environment.

Indeed, research studies that are conducted using this approach can occur in laboratory setting, in which an experiment may focus on one or two isolated variables under a controlled laboratory environment, or in a field setting, in which the investigators “treat” whole groups of people in different ways in real-life situations (Yin, 2008). If the objective of the research study is to build and test theory, experiments performed in field settings have much greater external validity than those performed in laboratories (Flynn, 1990).

The adoption of the experiment approach to conduct a research study is appropriate when “how” and “why” questions are posed to understand causal processes; although, the researcher’s limited control of the natural setting may preclude accurate conclusions about causality (Flynn, 1990). However, as changes after the experiments are not permitted, examination of potential improvements is useful for future work using the same or similar instruments (Schulz, 1999).

Nevertheless, the key weakness feature of this research approach is associated with “the limited extent to which identified relationships exist in the real world due to oversimplification of the experimental situation and the isolation of such situations from most of the variables that are found in the real world” (Galliers, 1991, p.150) and the difficulty to control the complexities surrounding “real” operation where an experiment is carried out (Meredith, 1989). It can be argued that these are reasons why the experiment approach method has not had extensive use in operations management disciplines (Gupta et al., 2006), as it is difficult to find organisations that are prepared to be experimented on and still more difficult to achieve sufficient control to make replication feasible.

3.1.4. Historical/archival analysis

The historical/archival approach is often adopted when it is not possible to collect field or case study data due to the lack of resources in terms of cost, time, or other constraints (e.g., collecting data from previous time periods) (Gupta et al., 2006). Some scholars take

advantage of this research approach when they are engaged in non-historical investigations of documents and texts produced by and about contemporary organizations, often as tools to supplement other research strategies (field methods, survey methods, etc.) (Ventresca and Mohr, 2002; Flynn, 1990). Particularly, the main contribution of the historical method is in addressing the “dead” past that is, when no relevant persons are alive to report, even retrospectively, what occurred and when an investigator must rely on primary documents, secondary documents, and cultural and physical artifacts as the main sources of evidence (Yin, 2008). It can be argued that no manipulation of the variables is possible and the only control the researcher can exercise is that of selecting and culling for particular evidence or factors and then interpreting it (Meredith, 1989). This approach is often adopted in disciplines such as medicine, engineering and finance (Gupta et al., 2006)

Nevertheless, as the archival research approach involve the study of historical documents; that is, documents created at some point in the relatively distant past, it can be argued that that the data may be unreliable because previous researchers did not collect the data following the conventional research standards or did not control the way how the data was collected. Therefore, the data may be characterized by being incomplete and without a sufficient reliability to conclude causal relations.

3.1.5. Survey research

Survey research approach is a theory testing methodology which is used to obtain information from large and well-defined samples of a population (Bennett et al., 2011; Visser et al., 2000) to quantitatively draw inferences regarding existing relationships (Dillman, 2000).

By collecting information related to people’s perceptions of object reality (e.g., practices, situations or views) through a face to face interview, telephone electronic mail, this research approach allows to gain insights into how people influence, and are influenced by, a phenomenon (Visser et al., 2000). Survey are well suited to descriptive studies, but can also be utilized to explore aspects of a situation or to seek explanation and provide data for testing hypotheses (Kelley et al., 2003). Indeed, Forza (2002) study argues that the survey research can be often distinguished as:

- Exploratory survey research which focuses on gaining preliminary insights on a topic to determine the concept to be measured. Besides, this typology of survey research may be considered to provide preliminary evidence of association among concepts as well as explore the valid boundary of a theory.
- Confirmatory survey research which aims specifically to test well-defined concepts and assess relationships between constructs that have been defined in previous research studies (Nazari et al., 2006; Forza, 2002).
- Descriptive survey research, which based on a well-defined research design, aims to gather data from predefined categories of respondents to provide statistically inferable data of the distribution of the phenomena in a population. The main reason to use this typology of survey research is to better explain the effects of a phenomena on a group of people, providing useful evidences for theory building and for theory refinement.

Based on these above typologies of the survey research approach, it can be asserted that the survey strategy is appropriate when “how, what, where, who, how much and how many” questions are formulated (Yin, 2008) to describe associations typically at a single point in time (i.e., cross-sectional survey) or more than one point in time (i.e. longitudinal survey) using questionnaires, face to face interviews and telephone interviews (Kelley et al., 2003). As this research strategy aims to collect data on a certain phenomenon, it is not required a control of the variables (Kelley et al., 2003) because the main contribution is the description of the important factors associated with the phenomenon (i.e., demographic, socio-economic and health characteristics, events, behaviours, attitudes, experiences and knowledge) (Glasow, 2005).

To conduct a research study using the survey approach, the following essential steps must be performed:

1. First, to define the purpose by specifying the research and the survey questions aimed to achieved the well-defined set of research objectives (Leeuw et al., 2008; Kelley et al., 2003).

2. Second, to establish a conceptual model which encompasses the construct definitions, hypothesised relationships among these constructs, hints on the research feasibility, boundary conditions and the unit of analysis (Forza, 2002). Researchers are advised find previous surveys on similar topics to gain knowledge of different survey designs and instruments to collect data
3. Third, to develop the survey design. Forza (2002) underline the importance of this stage as it is set up all activities that precede the data collection. Specifically, the sampling process and the mean to collect data (e.g., telephone, interview and mail) are defined in this stage. Additionally, the validity tests of the data and the manner to analyse the causal relationships are planned in this stage.
4. Fourth, to design the data collection process based on the target sample and the development of the instrument to obtain the needed data. Questionnaires and interview meetings are the most common methods to collect data (Kelley et al., 2003)
5. Fifth, to perform a pilot test to minimise and prevent future problems during the data collection stage and to check over the instrument are easily understood and correctly interpreted by the respondents (Kelley et al., 2003; Visser et al., 2000). Furthermore, this pretesting step is important to assess the protocol to obtain the needed data, as it is conducting following the same procedure.
6. Sixth, to execute the data collection in a rigorous and ethical manner (Kelley et al., 2003).
7. Seventh, to analyse the data following the planned test (i.e., validity tests) that were established in the survey design (Leeuw et al., 2008; Kelley et al., 2003; Forza, 2002).
8. Eighth, to report the results of the survey research in order to reviewers and readers understand whether the research objectives were achieved, evaluate critically what the work demonstrated and reproduce the work or compare the results with similar studies (Kelley et al., 2003; Forza, 2002).

The advantages of the survey research comparing to other research methodologies regard that this research strategy is more time efficient than performing personal interviews,

mainly if the sample size is big. Moreover, survey research requires small investments to be developed and administered (Glasow, 2005). Often, conducting survey research design through questionnaire survey has become very simple with minimum budget due to advancement of the information technology compared to the other data collection instruments (Krishna and Kodali, 2014). Additionally, many social scientists still deeply believe that surveys are appropriate for the descriptive phase (Yin, 2008), as more variables can be evaluated contemporarily in real world environments which is an advantage respect to the experiment approach. Moreover, as survey research approach allows to obtain results that may be generalised from a sample to a population (Creswell, 2003; Bell, 1996). For these reasons, this method is extremely popular among academics (Meredith, 1989), as this research method can elicit information about attitudes that are otherwise difficult to measure using observational techniques (Glasow, 2005).

Nevertheless, this research approach also has some limitations. First, surveys are not suitable when the study aims to understand the historical context of the phenomena (Pinsonneault and kraemer, 1993). Second, biases may occur due to the lack of response from predetermined participants and the accuracy of the responses (Glasow,). Often, a fraction of the surveys may be returned, hindering that interesting responses cannot be easily followed up and providing only estimates for the population, not exact measurements (Salant and Dillman, 1994). Additionally, respondents may have difficulty assessing their own behaviour or hide inappropriate behaviour which may confuse the survey results.

3.2. Research methodology

The literature review of lean healthcare (See Chapter 2) revealed that there is a lack of empirical studies that evaluate the social effects of kaizen initiatives and their determinants, although it is wide recognized that the success of these improvement initiatives depends on achieving contemporaneity social improvement outcomes (i.e., employees' capabilities and attitude) and technical ones (i.e., operational performance) in the healthcare context (Holden, 2011; Joosten et al., 2009). Therefore, the social side of kaizen initiatives is an emerging field to be studied. In order to fill these gaps, the following research questions (RQ) were developed:

1. RQ1: What are the determinant factors of social outcomes of kaizen initiatives?
2. RQ2: How are these determinant factors related to the social outcomes of kaizen initiatives?

Based on the aforementioned research questions and considering the previous review of advantages and disadvantages of the research strategies in operation management, the survey approach was chosen due to:

- First, this methodology is adequate when “What” and “How” research questions are posed (Yin, 2008).
- Second, as the target of this study involves to describe the effects of kaizen initiatives on the social system of healthcare organizations (i.e., healthcare professionals), this methodology is suitable because it permits to describe how people is influenced by a phenomenon in a real-world setting (Kelley et al., 2003; Visser et al., 2000)
- Third, this research approach is more time efficient to obtain data from a representative sample, thus, the findings may be generalizable to a population (Kelley et al., 2003).

In this study, the systematic procedure suggested by Forza (2002) to address survey studies was partially followed. Indeed, it was anticipated the step of the design of data collection before the pilot test, as it can be argued that the pilot test should be conducted with everything ready (i.e., the data collection instrument, protocol) to execute the data collection. In figure 8, the survey procedure is illustrated. In the following paragraphs, it will be described each step of this procedure.

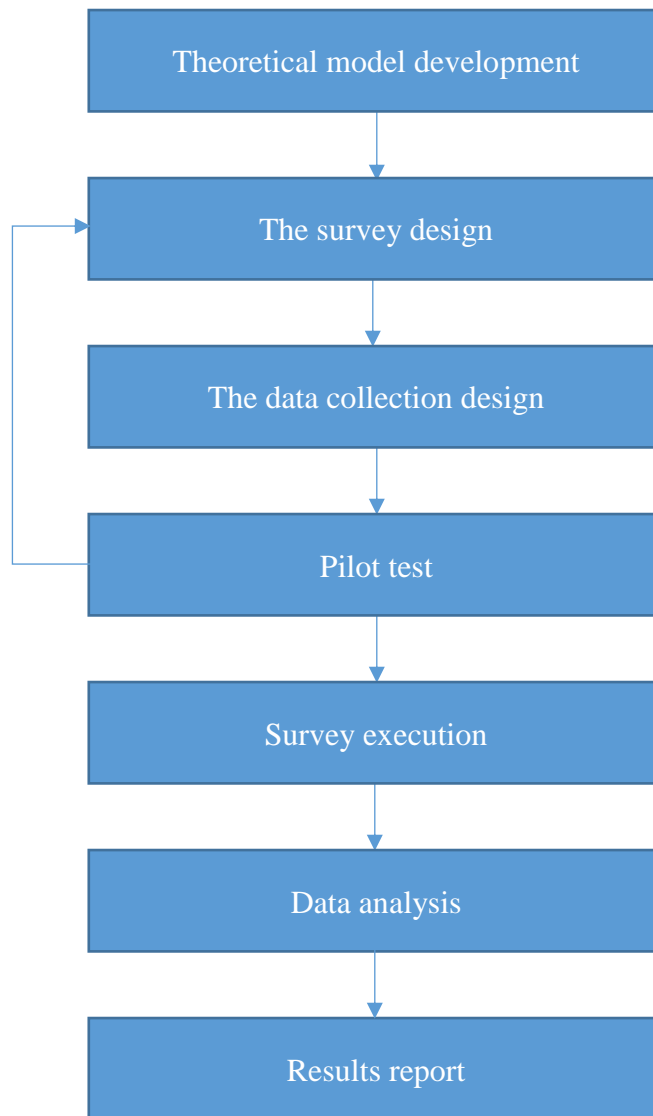


Figure 8: Survey research procedure (adapted from Forza, 2002)

3.3. Theoretical model development

As the survey research is a theory testing methodology, this field study presupposes the pre-existence of a conceptual model carefully defined by reference to the literature and by a logical thought (Flynn, 1990). This theoretical model contains the definitions of all constructs (i.e., theoretical concepts), the causal relationships (Moody, 2002), the explanation of the expected relationships, based on previous theories, and the definition of the boundary conditions under where the scholars might expect the phenomenon to exist

and manifest within a context (Wacker, 1998). Generally, the theoretical model is developed based on a review of the literature of the phenomenon to be studied, as it forms the basis for collecting and analysing data, and may be modified as consequence of the research. The resulting model is often depicted by a flow chart or diagram (Forza, 2002; Flynn, 1990).

As the objective of this study focuses on understanding the social outcomes of kaizen initiatives (i.e., the phenomenon) in the healthcare sector, a confirmatory survey research approach was considered to address this issue because, as Forza (2002) argued, this phenomenon was previously articulated in a theoretical form, in this case, by Farris et al. (2009). By performing an exhaustive review of published studies on team effectiveness and kaizen initiatives in the manufacturing sector, Farris et al. (2009) developed a conceptual framework using well-defined concepts and propositions from previous input-process-outcome models (e.g., Nicolini, 2002; Cohen and Bailey, 1997). Then, using an exploratory survey research approach, these authors tested the validity of the framework and the significance of the hypothesised relationships among the factors and outcomes. In the following paragraph, it is provided a deep description of the model of Farris et al. (2009).

3.3.1. The theoretical frameworks of social outcomes of kaizen initiatives

In healthcare, some scholars (e.g., Al-Balushi et al., 2014) tackle the social field of kaizen initiatives providing guidelines related to task definition, team composition process factors. However, most of these guidelines were not systematically assessed and are reported as conclusions of practitioner or theoretical studies based on secondary data (Holden, 2011; Joosten et al., 2009). For instance, the study of Holden (2011) developed a model of lean healthcare (see figure 9) to analyse the factors that may contribute to the success of lean implementation initiatives (e.g., kaizen initiatives) in healthcare. The authors argued that the implementation of the lean approach affects patient care and employees indirectly by changing work structure and process, the healthcare professionals directly, any employee and patient care changes can affect one another and the success of the lean implementation depends on how a particular lean initiative fits into the local context. However, this analytic

framework was used to just systematically analyse previous literature on the implementation of lean in the emergency department, thus, increasing the body of the theoretical knowledge of kaizen initiatives.

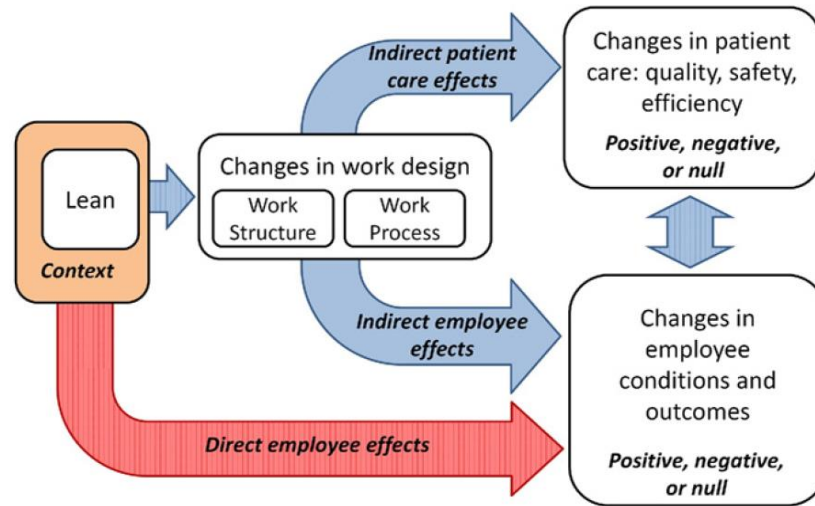


Figure 9: The human factors system framework proposed by Holden (2011) to assess the effects of lean initiatives on healthcare workers

Similarly, the Lemieux-Charles and McGuire 's (2006) study addresses the social benefits of teamwork activities aimed to provide the healthcare service and improve the service (e.g., kaizen initiatives, quality improvement initiatives) by articulating the literature of healthcare team effectiveness. By adapting the model of Cohen and Bailey (1997), the authors argue that these initiatives generate both objective outcomes (e.g., patient satisfaction, clinical quality of care, cost- effectiveness) and subjective ones (e.g., perceived task outcomes, well-being and willingness to work together in the future). However, once again, the framework was used to theoretically analyse the previous published studies. In healthcare, some scholars (e.g., Lemieux-Charles and McGuire, 2006; Devine, 2002; Sundstrom et al., 2000) do not discount this issue and call for the adaptation of models from other sectors to study specific phenomenon in the healthcare context instead of developing a general model that could guide decision makers (e.g., healthcare managers, teams) in the healthcare sector. Thus, the current body of knowledge of team effectiveness and improvement initiatives in healthcare is increased.

In manufacturing sector, Farris et al. (2009) developed a theoretical framework to analyse the determinants of social outcomes of kaizen initiatives. Besides being one of the few contributions focusing on assessing the effectiveness of kaizen initiatives in terms of social outcomes, this study provides a systematic and deep treatment of the phenomenon. It can be argued that the assessment of the Farris et al.'s (2009) model in the healthcare context can be seen as a further development of the original model and the generalizability of its findings in a different sector. Besides, the selection of the Farris et al.'s (2009) model, even though it was developed for the manufacturing context, is supported by some scholars' recommendations (e.g., Lemieux-Charles and McGuire, 2006; Devine, 2002; Sundstrom et al., 2000) which suggest to adopt models from other sectors to study specific phenomenon in the healthcare context. Thus, the current body of knowledge of team effectiveness and improvement initiatives in healthcare is increased. In the following paragraph, it is provided a deep description of the model of Farris et al. (2009).

3.3.2. The theoretical framework of Farris et al.

The Farris et al.'s (2009) model was developed after reviewing and combining the many scientific contributions related to team effectiveness and kaizen initiatives in the manufacturing sector. As the unit of analysis is the kaizen initiative team, as it represents a specific type of team, the authors acknowledged that: first, there is no an agreement on the factors that determine the initial outcomes of kaizen events, in our study kaizen initiatives, and second, although there is not a consensus in the set of variables that determines the team effectiveness, there is a consistency in the types of factors identified. Based on this recognition, Farris et al. developed measurement scales on determinants, social outcomes, technical outcomes which then were framed on the renowned input-process-outcome framework (Guzzo and Shea, 1992; McGrath, 1964) to establish the linkage and direction of the relationships between the determinants and the outcomes. Specifically, the authors classified the determinant factors as input ones those related to the kaizen initiative design and organizational support and work area characteristics, as process ones those related to the group activities and psychosocial traits yielded due to team members interactions. Furthermore, the kaizen initiatives outcomes were distinguished into in technical system outcomes (organizational performance improvements) and social

system outcomes (problem solving skills and attitude). Then, the authors developed hypotheses on the factors that directly or indirectly determine kaizen initiatives outcomes. It is important to clarify that the initial model developed by Farris et al. (2009) included also the technical outcomes related to the improvements of the technical performance of the work area, however, as the scope of this research study focuses on understanding the effects of kaizen initiatives on the social outcomes, technical outcomes were not considered in this research study. Once the conceptual model was already developed, the authors test the validity of the scales of this model following an exploratory approach and using data from 51 kaizen initiatives in 6 manufacturing companies. The measurement scales of the framework overcame the cut-off Cronbach's value of 0.7, guaranteeing the reliability of these scales. Furthermore, the relationships between determinant factors and social outcomes were statistically significant at 0.05 level. As a result, the construct validity for most of the initial scales was verified, except for the understanding of continuous improvement and skills which were finally gotten together to construct the scale called kaizen capabilities. The validated model is shown in Figure 10.

3.3.3. The theoretical framework

Based on the above description of the Farris et al.'s (2009) model, it can be argued that the use of this model results more convenient to understand the social benefits of kaizen initiatives in healthcare, as among the few studies that deal with these phenomenon (e.g., Holden, 2011; Lemieux-Charles and McGuire, 2006), as kaizen initiatives, the study of Farris et al.'s (2009) is the unique one that provides a deep treatment of the topic and a successful attempt to operationalize this issue. Besides, the selection of the Farris et al.'s (2009) model, even though it was developed for the manufacturing context, is supported by some scholars' recommendations (e.g., Lemieux-Charles and McGuire, 2006; Devine, 2002; Sundstrom et al., 2000) which suggest to adopt models from other sectors to study specific phenomenon in the healthcare context. Thus, the current body of knowledge of team effectiveness and improvement initiatives in healthcare is increased. Finally, the assessment of the Farris et al.'s (2009) model in the healthcare context can be seen as a further development of the original model and the generalizability of its findings in a different sector.

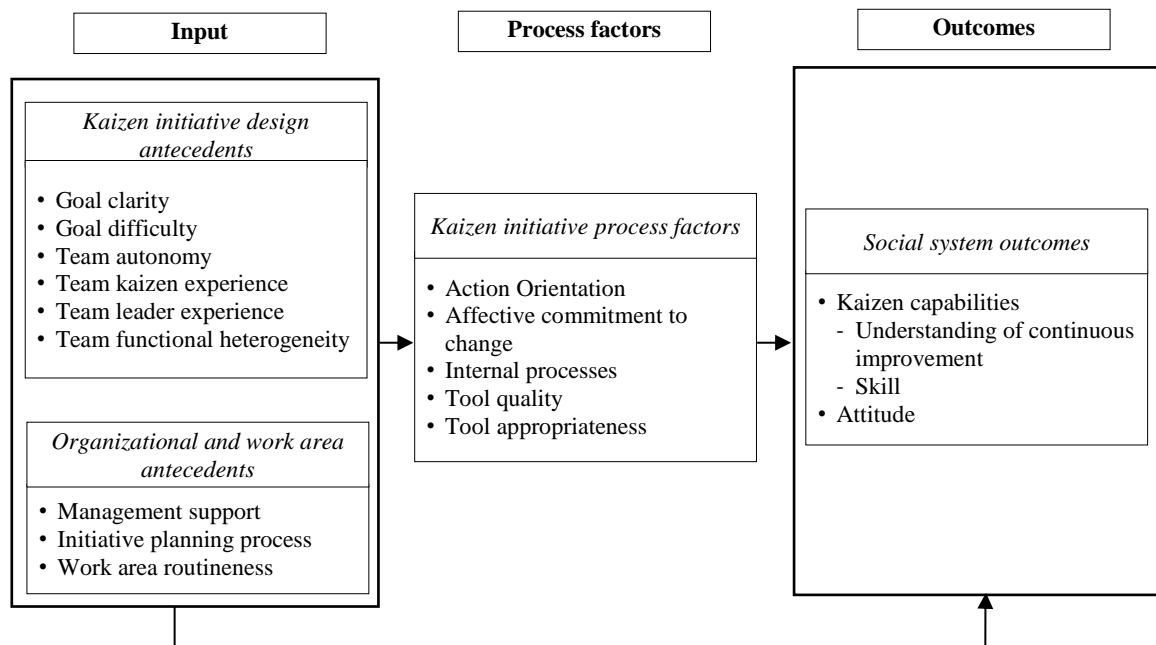


Figure 10: Theoretical model adapted from Farris et al. (2009)

In this study, the final validated model was used to study the phenomenon in the healthcare sector due to the same social targets of the kaizen initiatives and the role of the employees (i.e., healthcare professionals) within these improvement initiatives. However, it may be argued that some of the main determinants and the established relationships, that were found by Farris et al. (2009), may not be similar in healthcare due to the characteristics of this sector and the objectives of the teams that conduct the kaizen initiatives. On the one hand, the healthcare sector is characterized by being a more complex system than the manufacturing sectors, as it involves a more extensive and often intensive engagement of healthcare professionals (e.g., physicians, nurses) who are constantly dealing with risks that could damage the recovery process of their patients, that is, there is no chance to fail. On the other hand, due to the high degree of accountability in this sector, healthcare team members personally desire to know and learn new ways to meet the needs of their patients (Mickan and Rodger, 2000) because they always go hand-in-hand with the patients (Jaca et al., 2013). Instead, team members of the manufacturing sector almost never meet the end-consumers and usually conducts improvement initiatives that aim to improve processes and maintaining standards (Jaca et al., 2013). Therefore, it is evident that teams

that fulfil the improvement initiatives (e.g., kaizen initiatives) are different between these two sectors.

3.3.4. Hypothesis development

Following the survey research procedure, particularly the guidelines of Forza (2002), once the conceptual model is defined, the subsequent step involves to provide and test the operational definition of each construct. Based on these outcomes, it will indicate more details to translate the relationships among the constructs into hypotheses.

The development of the operational definitions is conducted by listing the observable elements (i.e., items) and specifying how these elements are observed. Whenever people's feeling attitudes and perceptions are involved, it is recommended to use multiple elements to measure operational definitions. Instead, when objective constructs are considered, single direct questions would be appropriate. In this way, it is explained the extent to which each measure encompasses the domain of the theoretical definition of each construct which should be verified through the engagement of academic and practical perspectives in order to develop good preliminary scales. Based on these scales, the following sub-step involves to describe the relationships among the variables. Often, these relationships are logically conjectured on the basis of the network of associations established in the theoretical framework between two or more variables which are expressed in the form of testable statements.

In this study, the operational definition of each construct and their relationships were developed using the list of items provided in the questionnaire of Farris et al. (2009) and the network of associations established in the theoretical framework (see figure 10). These definitions and the relationships were subsequently tested using practical and academic perspectives.

Indeed, the content validity of the scales were tested, on the one hand, by engaging healthcare professionals who were contacted to obtain practical feedbacks related to how these constructs are understood in the healthcare sector and to identify peculiarities of the healthcare sector. Healthcare professionals from Italy and Spain with high experience in

the implementation of lean management provided positive feedbacks about the theoretical concept of each construct. On the other hand, academic experts in lean management were contacted to verify the accuracy of the operational definitions of the scales. Based on these well-defined scales and the relationships, a literature review to provide theoretical support to the list of the observable elements (i.e., the scale items) that constitutes the operational definitions of each construct was conducted to assess whether the observable elements, i.e. the items, are suitable to constitute the operational definitions. The list of the scales and their items are reported in appendixes C and D.

In the following section, it is provided a review of the current literature, which focused mostly on healthcare studies, aimed at describing the various elements of the theoretical framework and understanding whether the relationships highlighted in this model held in the healthcare context.

3.3.5. Review of input factors of social outcomes of kaizen initiatives

According to Farris et al. (2009), the input factors concern those related to the design of the kaizen initiatives (e.g., goal clarity and difficulty, kaizen experience of team members and cross-functional composition) and those related to the context of the event, such as time and other resources provided by the organization prior to the kaizen initiative (event planning process) and during its execution (management support); and the stability of the daily work activities (work area routineness). In the following paragraphs the description of each input factor and their relationships with the social outcomes are provided.

Goal clarity represents a shared understanding among team members of the initiative goals and activities to be performed in order to achieve targeted improvement outcomes (Langabeer et al., 2009; Lemieux-Charles and McGuire, 2006;). In healthcare, goal clarity is recognised as crucial to avoid the so-called ‘scope creep’ (i.e., enlargement of goals during a project implementation), and high levels of strain and work overload (Kim et al., 2009; Mickan, 2005; Elovainio and Kivimäki, 1996), which may negatively affect the attitude of employees participating in improvement initiatives. For instance, The Kim et al.’s (2009) study on lean healthcare study, which describes a set of improvement projects that were carried out at the University of Michigan Health System in U.S, suggests that

goal clarity is positively related to social system outcomes that are related to low levels of team members' overburden and frustration, therefore, better attitude. However, this relationship was not measured empirically. Additionally, the empirical study of Elovainio and Kivimäki (1996), which evaluated the responses of Finnish healthcare workers, only nurses, demonstrated that goal clarity is related to the social system outcomes that the authors measured as reductions of the level of tension and uncertainty of employees due to the structured actions developed in line with clear and measurable goals and the team cohesiveness. Furthermore, *goal clarity* is also important for developing employees' capabilities related to better communication of ideas and role definitions among participants of improvement initiatives (West and Lyubovnikova, 2013; Mickan, 2005). For example, the team literature study of Mickan (2005), which examines the empirical findings of interventional studies in healthcare organizations from U.K., U.S. and Australia, underlines the relationship between the goal clarity and team social outcomes that the author associates to the job satisfaction, high level of team members' participation, improved coordination, and correctly use of management skills. Nevertheless, the relationships identified by these studies were found as conclusion of previous studies.

Goal difficulty outlines challenging interventions and the need of various skills to reach the initiative goals (West and Lyubovnikova, 2013; Jimmerson, 2007). In healthcare, some scholars agree that goal difficulty can influence the social outcomes of a teamwork (e.g., Natale et al., 2014; West and Lyubovnikova, 2013). For example, the West and Lyubovnikova 's (2013) study of healthcare team literature suggests that the extent of the goal difficulty is positively related to a better interaction and cooperation among the team members. The authors argued that these social system outcomes are necessary for an effective performance and a sufficiently complex goal is required to build a team. However, Jimmerson (2007) suggests to avoid large or complex goals as their achievement can lead to unfocused and frustrating situations due to the involvement of too much diverse skills, therefore decreasing the willingness of participating to the initiative and precluding learning (i.e., attitude and capability). In the other sectors, the goal-setting study of Latham et al. (2008) in public sector underlines the positive relationship between challenging learning goals and social outcomes system that the authors associated with the

improvement of employee's knowledge. Additionally, the study of Strecher et al. (1995) argues that the level of difficulty of goals are related to social system outcomes that the authors considers as the level of satisfaction. However, the authors suggest that goals should be set considering the individual's self-efficacy level otherwise too difficult goals will not be performed or easy goal will not be taken seriously which would yield little satisfaction. However, the relationships suggested by these studies were not empirically tested. Conversely, the empirical study of Bradley and Willett (2004) examines kaizen projects carried out by students of the Cornell University's Johnson School. Based on reported experience of these students, the authors argue that team should set the goal difficulty in order to develop concrete solutions within a short timeframe. In this way, the level of team satisfaction would be enhanced due to the positive progress.

Team autonomy concerns the freedom given to team members to execute changes in a work area and how and when implement them during a kaizen initiative (Kirkman and Rosen, 1999). In healthcare, team autonomy is associated with social system outcomes in terms of better attitude and the development of employees' capabilities. Specifically, the lean empirical research of Drotz and Poksinska (2014), which evaluates the implementation of lean management in three Swedish healthcare organizations, demonstrated that team autonomy play a significant role in the adoption of positive attitude due to the increased responsibilities, freedom to perform a wider variety of tasks, cooperation for mutual benefit and the feeling of being respected and valued. However, the authors did not specify whether the lean implementation were conducted following a structured kaizen mechanism. Furthermore, *team autonomy* also contributes to the development of employees' capabilities in kaizen initiatives in healthcare, as autonomy stimulates employees to develop new skills when they are responsible of improving their work area by themselves (Drotz and Poksinska, 2014; Bahensky et al., 2005). For instance, the study of Bahensky et al. (2005), which describes the implementation of kaizen methodologies at the University of Iowa Hospital and Clinics during 5 days, suggest that team autonomy may contribute to enhance employee communication skills during the interactions with other team members and other employees outside the. Nevertheless, this relationship was not tested empirically, as it was a conclusion based on their kaizen initiative experience. In

other sectors, the empirical study of Janz et al. (1997), which analysed teams of knowledge management context, demonstrated that team autonomy, particularly the autonomy over planning decisions and over people decisions, is related to social system outcomes that the authors measured as team job motivation regardless of the interdependence level.

Team functional heterogeneity represents the professional diversity of team members that participate to kaizen initiatives, and is related to the different job categories of team members, i.e., doctor, technician, nurse, administrative staff in healthcare (West and Lyubovnikova, 2013; Mazzocato et al., 2010). In healthcare, the study of Lemieux-Charles and McGuire (2006), develops an integrated team effectiveness model based on the healthcare literature, highlights that *team functional heterogeneity* is related to social system outcomes that the authors associated with the attitudinal aspects of the team effectiveness. Moreover, *team functional heterogeneity* is related to a positive attitude of team members in healthcare, as the opportunity to interact and cooperate with other employees with different professions may increase their engagement to work (Yeatts and Seward, 2000). On the other hand, some scholars (e.g., Mazzocato et al., 2010; Mickan, 2005) argue that *team functional heterogeneity* is linked to improvements of employees' capabilities, as it provides an opportunity to collaborate with team members of a different professional background, therefore improving knowledge about current situation and different ways to improve it (e.g., errors in a procedure and how to achieve a better service). Furthermore, the healthcare teamwork review study of West and Lyubovnikova (2013) argues that multi-professional teams are linked to social system outcomes that the authors considers as improvements on the staff knowledge. In fact, the authors suggest that interdisciplinary teamwork guarantee a better decision-making process. Additionally, the study of Mazzocato et al. (2010), which analyses empirical studies of lean implementations, suggests that the *team functional heterogeneity* is related to social system outcomes that the authors considers as improvement of the knowledge because multidisciplinary teams strengthen the understanding and values to consider an error as a learning opportunity. Furthermore, the study of Mickan (2005), which review empirical studies, suggests that *team functional heterogeneity* (i.e. greater professional diversity) is related to social system outcomes related to the improvement of knowledge and the

organization of the daily tasks due to the more opportunities for discussion and learning in healthcare. However, there is an absent of empirical research to validate these relationships.

The Farris et al.'s (2009) theoretical framework also considers the effects of the team member and team leader experience on the social system outcomes. Specifically, *team kaizen experience* refers to the general experience developed by team members about a kaizen initiative, while *team leader experience* refers to the leadership experience developed by a team leader in guiding kaizen initiatives (Farris et al., 2009). The Holden 's (2011) study argue that both team member and team leader experience can be important to foster the development of employees' capabilities in healthcare (Holden, 2011). This assertion is supported by Aij et al. (2013) which explained that a certain level of team members' and team leader's experience in lean projects fosters the acquisition of new knowledge on lean tools and methods after investigating the experiences of surgical and nursing professionals who participated in the lean training programmes. Aij et al. (2013) demonstrated that the *team leader experience* is also related to a positive attitude of all the team members, as the experience gained by the team leader from past projects helps to better guide the team during the improvement initiative, increasing members' commitment (Kimsey, 2010; Raab et al., 2006). In other sectors, the empirical study of Easton and Rosenzweig (2012) examines project teams that carried out six sigma improvement projects during 6 years in manufacturing sector. The authors examine the relationship between individual team member and team leader experience and the process adoption of problem-solving skills. The authors demonstrate that only the experience of team leader contribute to the process adoption of problem-solving skills. In contrast, the authors do not found any statistical support that links the individual experience and improvement project success. Moreover, the empirical study of Bradley and Willett (2004) argues that the experience of the team leader positively contribute to the correct adoption of improvement tools, guarantying the success of the kaizen project. Conversely, the kaizen event study of Farris et al. (2009) demonstrates that the extent of experience of team leader is only positively related to the attitude and negatively related to the improvement of problem solving skills. The authors argue that this negative effect is due to experienced team leaders

tend to jump steps of the kaizen paradigm, limiting the team creativity and team participation during the problem-solving process.

Besides, within the Farris et al.'s (2009) theoretical framework, it is highlighted the effects of the resources provision to plan and execute the kaizen initiatives which the authors called these effects as *management support and event planning process*. In healthcare, these variables integrate all the resources – in terms of materials, equipment, support by other employees in the organization and sufficient time for set-up activities – that are needed to achieve the target improvement in a work area (Al-Balushi et al., 2014). Specifically, *management support* refers to the resources provided during the kaizen initiatives (e.g., materials, equipment, support by other employees in the organisation) whereas *initiative planning process* represents the resources provided prior to conduct the kaizen initiative (e.g., training, time for set-up activities). Some scholars suggest that *management support* may contribute to improve social outcomes in healthcare, as employees are able to test and execute their improvement ideas without any resource constrain, enhancing their motivation to participate actively and enthusiastically in lean initiatives (Al-Balushi et al., 2014; Andersen et al., 2014; Dickson et al., 2009). The Al-Balushi et al.'s (2014) review of the lean healthcare literature suggests that the management support, which is represented by the availability of resources, is determinant to achieve social system outcomes that the authors considered as the necessary behaviour that contribute to the cultural change that is needed for lean implementation over a healthcare organization. In addition, the study of Dickson et al. (2009), which examines the lean management implementation at the emergency department of a U.S. hospital, argue that the management support is related to social system outcomes that the authors consider as the employee eager to generate improvement ideas. Additionally, the systematic review study of Andersen et al. (2014), which examines the facilitators for a successful lean management implementation in hospitals, argues that the management support, i.e. the sufficient resources and the accurate data and training, is crucial to obtain social system outcomes that the authors consider as a better use of employee's skills and creativity and a motivation to improve their work area.

For what concerns the *work area routineness*, this variable represents the regularity of the processing steps or activities to deliver a service in a work area (Farris et al., 2009). In healthcare, the study of Ballé and Régnier (2007), which describes the lean management implementation within the nursing practice, argues that a basic stability of the work environment activities allows employees to effectively adopting problem-solving skills and developing a better awareness of waste within their work area during the kaizen activities. However, there are also opposite arguments on the relation between the *work area routineness* and social outcomes. For example, the Mazzocato et al.'s (2010) study on the healthcare sector suggests that a work area characterized by an absence of routines in a work area enables team members to improve their problem-solving skills and their capability to recognise and reduce waste. Therefore, the theoretical relationship between the *work area routineness* and the improvement of skills is still not clear in the healthcare sector. In other sectors, Farris et al., (2009) demonstrated that the stability or routineness within a work area is significantly and positively associated with social system outcomes that the authors measured as problem-solving capabilities of team members.

Overall, based on the above discussion on the relationships between input factors and social outcomes in healthcare, it can be hypothesised:

Hypothesis 2.1 (H2.1): Input variables have a direct relationship to social outcomes.

3.3.6. Review of process factors of social outcomes of kaizen initiatives

Based on the Farris et al.'s (2009) study, process factors concern variables related to the effective teamwork during kaizen events, such team focus on implementation rather than analysis (action orientation), team member buy-in for the goal of the event (affective commitment to change), quality of team coordination processes (internal processes), proper selection (tool appropriateness) and use (tool quality) of lean tools according to the kaizen initiative goal. In the following paragraphs the description of each of these process factors and their relationships with the social outcomes are provided.

Action orientation represents the preference of team members to experiment and implement improvement ideas in the work area rather than spending a lot of time to analyse

and plan potential improvements before action (Farris et al., 2009). In healthcare, some studies (e.g., Fine et al., 2009; Jimmerson et al., 2005) suggest that *action orientation* may contribute to improve employees' capabilities and attitude because hands-on experiences help workers to immediately understand and recognise the benefits of kaizen initiatives, as these experiences allow healthcare professionals to enhance their array of skills and their motivation. Moreover, the study of Jimmerson et al. (2005), which described a case study in Anatomical pathology lab that decided to test the Toyota principles, argues that the real-time engagement of employees to identify problems and propose problem-solving ideas are both related to the better level of staff motivation and to efficiently enhance their own work. Similarly, the study of Fine et al. (2009) points out some lessons of semi-structured interviews of five Canadian healthcare organizations. The authors reported that the interviewees agreed with the hand-on experiences are related to social system outcomes that the authors consider as the understanding and learning of lean thinking approach. Nevertheless, the relationship identified by these studies are based on anecdotal data. Therefore, it is needed to conduct empirical studies to confirm the significance of these relationships.

Internal processes represents the value and respect of contributions, opinions and feelings of other team members, including employees with different professions during the open communication in the kaizen initiative. Good interpersonal dynamics among team members favour the establishment of the right environment for the generation of new improvement ideas (Bahensky et al., 2005). This is a reason why *internal processes* are indicated as a facilitator of the development of employees' capabilities and attitude in healthcare (Ghosh and Sobek II, 2015; Drotz and Poksinska, 2014; Bahensky et al., 2005). For example, the problem-solving study of Ghosh and Sobek II (2015), which empirically examines the improvement process cases in one hospital of U.S, demonstrated that *internal processes* dynamics related to the communication of improvement ideas have a relationship with the improvement of knowledge, confidence and enthusiasm of employees participating to kaizen initiatives. In addition, the study of Bahensky et al. (2005) underline that the team dynamics are related to social system outcomes that the author consider as the generation of creative ideas on how to change the current state of the processes.

Furthermore, the review study of Lemieux-Charles and McGuire (2006) suggest that a good communication and trust commitment without conflicts and with high levels of collaboration, coordination, cooperation among the team members are related to successful subjective outcomes (i.e. attitudinal outcomes). In other sectors, the empirical study of Garcia et al. (2014), which examines the human factors of kaizen programs in the manufacturing sector, found that good communication and motivation are related to social system outcomes that the authors measured as workers' abilities, skills and motivation.

Affective commitment to change represents team members' strong belief in potential benefits deriving from the execution of kaizen initiatives in their work area (Hung et al., 2015). In healthcare, *affective commitment to change* is vital to improve social outcomes as it contributes to promote cooperation and stimulate enthusiasm for the initiative (Herscovitch and Meyer, 2002). Some scholars (e.g., Andersen et al., 2014; Poksinska, 2010) suggest a relation between employees' commitment and their skills, knowledge and creativity as employees feel that the change is valuable for their work area and, therefore, it is worth investing in developing the capabilities needed to achieve the initiative objective. Indeed, the study of Andersen et al. (2014) argues that staff commitment is facilitator for lean implementations. These authors suggest that this facilitator contributes to achieving successful social system outcomes related to a better use of the employee's skill and creativity and a positive attitude to participate in future lean initiatives. However, this study is just theoretical. Similarly, the empirical study of Laureani et al. (2013), which examines an improvement project that was carried out at an Irish Hospital in line with the lean six sigma approach, demonstrated that the commitment of employees is related to social system outcomes that the authors considered as an increase of employee's knowledge of the healthcare process. In the change management sector, the empirical study of Herscovitch and Meyer (2002), that evaluates the hospital nurse responses in the organizational change management context, found that *affective commitment to change* of employees is related to social system outcomes that the authors measure as employee's behavioural support, cooperation and enthusiasm. Additionally, the empirical study of Nijhof et al. (1998), which examines the responses of human resources managers of many organizations from Netherlands, found that employee commitment to change is related to

social system outcomes that the authors measured as the contribution of new ideas due to the active participation in the change process.

Finally, with respect to *tool appropriateness* and *tool quality*, while *tool appropriateness* refers to the suitability of a tool to address problems and achieve an initiative goal, *tool quality* evaluates the goodness of a tool implementation during the kaizen initiative (Farris et al., 2009). Therefore, both *tool appropriateness* and *tool quality* correspond to the correct decision to adopt the problem-solving tools and the level of excellence of their use during the kaizen initiative respectively. Some studies in healthcare (e.g., Van Vliet et al., 2010; Raab et al., 2006; Douglas and Judge, 2001) consider the relationship between lean standards – including both tool appropriateness and tool quality – and social outcomes. For instance, the Raab et al.'s (2006) study, which examines the improvement of Papanicolaou test quality due to adoption of Toyota production methods, argues that the systematic approach of implementation of the quality assurance programs (Toyota Production Methods) impacts on social system outcomes that the authors consider as individual practitioner changing behaviour. Furthermore, the single case study of Van Vliet et al. (2010), that analyses the efficacy and efficiency of the adherence of the lean cataract pathway by workers at the Rotterdam Eye hospital, suggest that a strictly staff adherence to the lean pathway design (i.e. the lean best practices) impacts on the behaviour of clinicians which guarantee effective outcomes of the service. However, these relationships were not tested empirically. Additionally, the empirical study of Douglas and Judge (2001), which examines the implementation of continuous improvement practices in 193 hospitals of U.S, demonstrated that the degree of implementation of these practices is positively related to the increased understanding of the value of the improvement approach, and in this way, the standardization of these practices contribute to the improvement of effectiveness and efficiency of the hospital service.

The above arguments concerning the relationships between process factors and social outcomes in healthcare leads to hypothesise that:

Hypothesis 2.2 (H2.2): Process factors have a direct relationship to social outcomes.

3.3.7. Indirect relationships

In respect to the indirect relationships and considering the input-process-outcome framework (Guzzo and Shea, 1992; McGrath, 1964), Farris et al. (2009) assume that process factors may mediated the relationships between input factors and social outcomes, as the input factors may influence how team members interact and perform the activities in the kaizen initiatives which will consequently yield improved social outcomes. In order to support the feasibility of this indirect effect in the healthcare sector, the discussion below addresses this issue by reviewing the current literature that gives hints on the mediation effect of the process factors.

In healthcare literature, some scholars (e.g., West and Lyubovnikova, 2013; Lemieux-Charles and McGuire, 2006; Galletta et al., 2011) give hints that can support the Farris et al.'s (2009) assumption on the indirect relationship between some input factors (e.g., goal clarity, goal difficulty, team autonomy and team functional heterogeneity) and the improvement of employees' capabilities and the attitude through the kaizen initiative process factors related to the interactions and cooperation between team members that are associated with both social outcomes in healthcare. For example, West and Lyubovnikova (2013) suggest that goal clarity and goal difficulty are associated with internal processes and these relationships serve as the foundation for the improvement of employee capabilities. Goal clarity and goal difficulty are indeed a tacit factor of the improvement of knowledge and positive attitude of human resources. Internal process is associated with the generation and communication of improvement ideas. In fact, when the goal is well defined and enough complex, the interpersonal dynamics among team members are better established as the clarity and difficulty of the goal foster cooperation and open communication. Taken together, when the goal is well defined and the goal is enough complex, internal processes in terms of high levels of interaction and co-operation are better carried out. This, in turn, contribute to the improvement of the knowledge of human resources and improve the employee's enthusiasm to continuously participate in improvement activities. Similarly, the Drotz and Poksinska 's (2014) study argues that team functional heterogeneity is indirectly associated with a better climate at work area through internal processes. The fact that multidisciplinary teams carried out the kaizen

activities foster the cooperation of team members without any hierarchical issue, generating a good climate at work (Drotz and Poksinska, 2014).

Furthermore, some scholars (e.g., Galletta et al., 2011; Karim, 2010; Parker, 2001) argue that the autonomy and freedom about how and when to do work is associated with the affective commitment to change, as it activates a sense of attachment to management and to one's own work environment that in turn could reduce employee's desire to leave the organization. It can be argued that this indirect effect may be similar when the autonomy power of healthcare professionals is extended to decisions about the improvements of the work area. Therefore, healthcare workers would be encouraged to believe in the benefits of kaizen initiatives for themselves and the organization. This in turn will willingness incites healthcare workers to act more eagerly and enhance their employee capabilities.

Additionally, team kaizen experience may be associated with the action orientation, as healthcare workers, having a sufficient experience on lean tools and practices, would spent less time to plan and conduct the improvement initiatives, therefore, improving their social outcomes in terms of skills and motivation.

Based on the aforementioned hints on the indirect relationships, we can support the following hypothesis:

Hypothesis 2.3 (H2.3): Process factors mediate the effect between input factors and social outcomes

3.4. The survey design

The survey design encloses all the decisions related to the activities that precede the data collection, and countermeasures to address eventual future shortcomings and difficulties during this stage. In this way, the quality of the survey research study is ensured.

Following the Forza 's (2002) guidelines, once the operational definition of each variable is well defined and tested and the hypotheses are formulated, it is needed to set up a suitable survey design to address the research questions (Visser et al., 2000). In this study, the survey design is illustrated in figure 11.

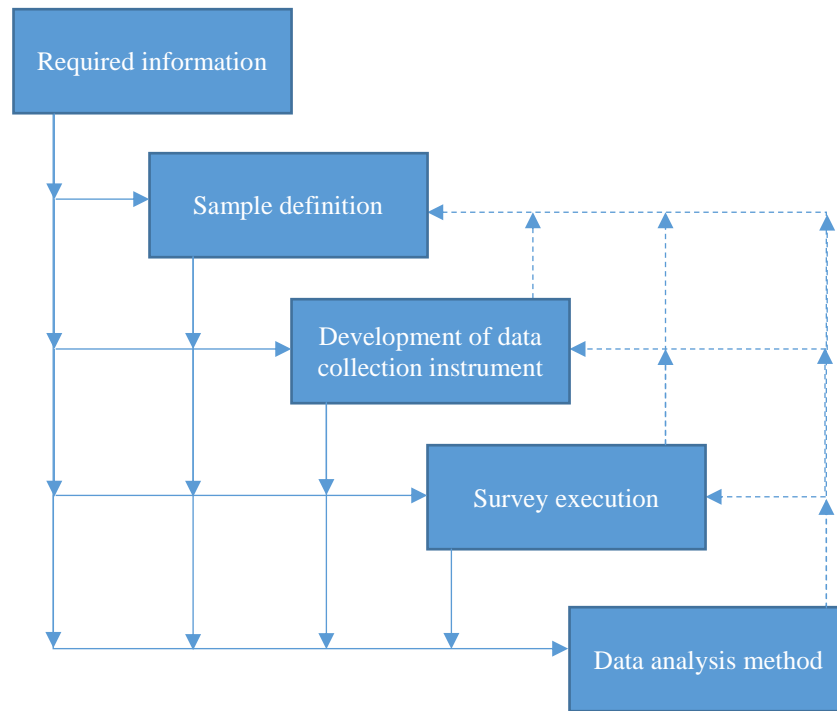


Figure 11: Survey design (adapted from Alreck and Settle, 1985)

The development of the survey design (figure 11) starts by identify the needed information and the informants, based on the stated hypotheses and the objectives of the research study, to prevent or at least to reduce potential errors (Leeuw et al., 2008; Forza, 2012). Indeed, a trade-off between time and costs resources and the minimisation of the four type of errors (i.e., sample that does not represent the population, use of incorrect theoretical dimensions, false statistical conclusions and doubtful explanations) should be accounted to not make the research study infeasible (Leeuw et al., 2008; Guyette, 1983). Furthermore, decisions about the way to collect data (e.g., interviews or questionnaires using telephone or mail) and the time horizon (cross-sectional or longitudinal) must be defined in this stage, as the sample selection and the development of the data collection instrument will depend on these decisions. Some scholars (Visser et al., 2010; Guyette, 1983) argue that cross-sectionals design is suitable when the research aims to document the predominance of special characteristics in a populations or conditions of an area at a single point in time.

Instead, when the research aims to evaluate if change is occurring over time, longitudinal designs is often selected (Guyette, 1983).

In this study, it was decided that the data collection will be conducted using questionnaires which will be administered personally. Besides, a cross-sectional design was chosen as it offers the possibility to answer the research questions and test the hypotheses between the input and process factors and the social outcomes that were described in the theoretical model. Indeed, cross-sectional design allows to test causal hypotheses using regression techniques to test the direct causal impact of a variable A on a variable B. Furthermore, the causal relations can also be analysed using path analytic techniques to test hypotheses about mediators of causal relations (Baron and Kenny, 1986) thereby validating or challenging notions of the psychological mechanism involved (Visser et al., 2010).

After establishing what kind of information will be gathered, the next step is selecting the sample, that is, the subset of the population which allows researchers to understand and generalise the characteristic of sample to the population elements. The sampling design starts by initially defining the populations (Guyette, 1983) from where it will be selected the sufficient number of elements to overcome the difficulties of collecting data from the entire population.

3.4.1. The sample selection

The sampling design starts by initially defining the populations (Guyette, 1983) from where it will be selected the sufficient number of elements to overcome the difficulties of collecting data from the entire population. Therefore, the sampling design plays a crucial role to assure the representativeness of the sample to generalise the results on the population (i.e., probabilistic sampling) or to demonstrate that time and other factors prevail on generalisability considerations (i.e., non-probabilistic sampling). Furthermore, once the population was defined, another important detail to be established is the sample size, as it is associated with the fact of rejecting the null hypothesis when it is true (i.e., type I error) and of not rejecting the null hypothesis when the alternative hypothesis is true (i.e., type II error), as the significance level and statistical power of the test and the size of the relationships depend on it. Additionally, it was considered the selection criteria

proposed by Farris et al. (2009) to test theoretical framework, thus, ensuring the validity and reliability of the results. In this way, a comparison between the Farris et al.'s (2009) findings and the findings of this study can be made.

In this study, the Italian healthcare organizations that currently implement the lean management was chosen as the population. Following the sample selection of Farris et al. (2009), which were adapted to the healthcare context, it was established that among these healthcare organizations, only those that match the following selection criteria will be involved in this study. The selection criteria to select the Italian healthcare organizations are:

- The healthcare organizations provide the same typology of service.
- The healthcare organizations consider the lean management as their formal improvement strategy.
- The healthcare organizations have at least 2 years of experience implementing the lean management.
- The healthcare organizations perform often the kaizen initiatives.

Based on the above selection criteria, it was sought for healthcare organizations that are implementing the lean management in Italy using contacts and reports. Particularly, this research started considering the Longo et al.'s (2013) report which reveals that only 6 healthcare organizations have been implementing the lean management to achieve improvement targets in Italy. These healthcare organizations are listed in table 3.

As shown in table 3, Longo et al. (2013) unveiled that the idea to implement the lean management in these Italian healthcare organizations emerged from internal individuals (e.g., manager, physicians, nurses) who believed that this paradigm could solve their economic and quality problems. Within these healthcare organizations, teams of facilitators and internal organizations were created to lead the adoption of the lean management using structured and non-structured initiatives. Additionally, these initiatives are performed to improve the healthcare process (i.e. the direct process to recover patients) and the

administrative process (i.e. the indirect process that sustain the direct process) that are present within each healthcare setting.

Table 3: Main healthcare organizations with more than one year of experience in Italy (adapted from Longo et al., 2013)

	Compare dimensions	Humanitas Hospital	Galliera Hospital	Local health authority N°4 of Chiavarese	Local health authority N°1 of Massa Carrara	Local health authority of Firenze	University hospital of Siena
Lean improvement strategy	Source of Motivation to change	Endogenous	Endogenous	Exogenous	Exogenous	Endogenous	Exogenous
	Action spectrum	Wide	Wide	Wide	Wide	Wide	Wide
	Typology of improvement initiative; Clinical (C) or Technical-administrative (TA)	C and TA	C and TA	C and TA	C and TA	C and TA	C and TA
	Permanent or temporary team	Permanent team	Permanent team	Temporary team		Permanent team	Permanent team
Organization type		Private	Private	Public	Public	Public	Public
Unique structured improvement mechanism		Yes	Yes	-	-	-	Yes

Based on the Longo et al.'s (2013) contribution, the healthcare organizations were contacted to confirm these findings and to require more information about the way how they are implementing the lean management. As a result of these interviews, only three organizations confirmed that they are currently implementing the lean management as their improvement strategy. These organizations are: University hospital of Siena, Galliera hospital and Humanitas Hospital. The other healthcare organizations declared that the initiatives to implement the lean management were stopped due to the lack of resources or because they are using a different improvement strategy.

The healthcare organizations, that confirmed lean implementation, were required more details about their lean management strategy in order to assess whether their organization characteristics and improvement approach fit the selection criteria proposed by Farris et al. (2009). In addition, it was required the possibility to visit on site the three healthcare organizations. However, only two out of three healthcare organizations (i.e., the University hospital of Siena and Galliera hospital) accepted to both requirements whereas the third one withdrew due to its organizational constraints.

When these two healthcare organizations were visited on site, it was confirmed that these two organizations fit effectively the selection criteria. During the visiting, the mid-level managers (i.e., who are responsible of the lean implementation in both hospitals) explained deeply why and how their organization are adopting the lean management approach. They provided formal organizational documents that demonstrate the commitment and support of the organization and of the local government toward the adoption of the lean practices within the healthcare work areas. However, these formal documents cannot be reported in this study due to organizational constraints of both healthcare organizations.

Both healthcare organizations adopt the lean management using formally initiatives which contain all the fundamental characteristics associated with kaizen initiatives. Specifically, the rationale is: front-line employees from different internal organizations (i.e. medical and non-medical organizations), in line with a bottom up approach, organize their teams by themselves and/or ask assistance to carry out kaizen initiatives when an improvement idea emerges to resolve any work area problem using the lean tools. Moreover, it is needed to remark that although the development of a kaizen initiative is not compulsory, many front-line employees have performed one initiative by themselves due to the benefits described during the training courses and tested by their colleagues. Additionally, there is an internal organization that was created and is currently responsible of leading the lean management implementation and to carry out the training programs in order to demonstrate the advantages and effectiveness outcomes of the improvement initiatives. In table 4, it is reported the characteristics of the two healthcare organizations that accepted to participate in this study.

As both healthcare organizations fit the selection criteria, they were invited to participate and cooperate with this research initiative. As motivation to cooperate, the objectives and benefits of this research were described to the lean facilitators and then to the hospitals directors. The management board of each hospital accepted to participate in this research initiative providing the permission to enter within the hospital and to obtain the required data. Furthermore, these two healthcare organizations provided important organization-level data, support from the top management and guaranteed a longer-term commitment to this research.

Table 4: Selection criteria of the healthcare organization (Farris et al., 2009).

Selection criterion	Description	University hospital of Siena	Galliera hospital of Genova
1. Organization type	Private/public	Public hospital	Public hospital
	No. employees	3000	1800
	No. beds	639	400
2. Kaizen experience	First kaizen experience	2013	2014
	Event rate during research	87 %	75%
	Percent of org. experience	33%	55%
3. Systematic use of kaizen initiatives	Yes/No	Yes	Yes
4. Kaizen event frequency during study period	Study period	2013-2015	2014-2016
	Average n° initiatives per year	40	24
	No. initiatives sampled	69	36

Both healthcare organizations were asked information about all kaizen initiatives according to a specific timeframe. For the case of the University hospital of Siena, the organization provided information of 80 kaizen initiatives that were performed from January 2013 – December 2014. For the case of Galliera Hospital of Genova, the organization provided information of 48 kaizen initiatives that were performed from January 2014 – December 2015. Due to the small quantity of these kaizen initiatives within both healthcare organizations, it was decided to sample all 128 the kaizen initiatives that were formally conducted.

3.5. The data collection design

Following Forza (2002), once the survey design and the sample were selected, the next step concerns the design of the data collection processes. The selection of the method for the data collection depends on the type of information, that is needed to be gathered, as well as, time, cost and resources constraints. The most common data collection methods are the interviews and questionnaires. On the one hand, interviews are used when it is solicited information directly from the respondents and higher response rate is required. Interviews can be conducting by scheduling a face to face interview or over telephone. However, this method is more expensive and there is a risk of interviewer bias. On the other hand, questionnaires are used to collect data from respondents who are asked to

complete it and then to send it back. This method is less expensive, ensures anonymity and reduces interviewer bias, however, the response rate is lower than other methods.

Based on the advantages and disadvantages of both data collection methods, it was decided to use the questionnaire methods due to the mid-level managers asked that the data should be managed anonymously. Moreover, it was created a list of all teams that perform the kaizen initiatives in order to identify the respondents to the questionnaires. Due to the peculiarities of the healthcare context, it was decided that the measurement instrument must be administered on site using pen and paper. The development of the measurement instrument is described in the following paragraph.

3.5.1. Instrument and measures

Two data collection instrument were used in this research (See appendix C and D). The measurement items for all constructs were adapted from the earlier empirical research of Farris et al. (2009) to the healthcare context. The items, which were originally proposed in English, were translated to the Italian and then were refined in collaboration with the mid-level managers and lean facilitators. The main reason for using these scales is that they were developed using both existing survey scales and the factor descriptions from the literature review of kaizen initiatives and team effectiveness. Specifically, the items included in the scales reflect the concepts, practices and social outcomes related to the performance of kaizen initiative and the development of the kaizen mentality in any context.

The multi-items scales were operationalized using the Likert scale ranging from 1 (“disagree”) to 6 (“agree”). These two questionnaires were composed of objective and perceptual measures. The facilitator questionnaire (See appendix C) was developed in order to be completed by lean facilitators, that is, those healthcare workers that were responsible for coordinating the project planning and guiding the team during the kaizen initiative (Farris et al., 2009). Therefore, lean facilitators are able to provide data on team characteristics and work areas where the kaizen initiatives were carried out. Rather, the team member questionnaire (See appendix D) was developed in order to be administered those healthcare workers that participate to the kaizen initiatives. This questionnaire

included 46 perceptual questions on problem-solving procedures, organizational support and social outcomes. Moreover, the both data collection instruments included a cover page with information about the benefits of the research and instructions to complete the questionnaire. Additionally, it was developed a protocol which contains all the instructions to provide the questionnaires to the respondents (see Appendix C).

3.6. Pilot test testing

Pretesting and piloting the questionnaires and examine the validity of their administration is useful to test the correct understanding of the questions by part of the respondents, and find eventual problems that may lead to biased answers. Although the fact that conducting pilot test does not guarantee success in the main study, it increases the likelihood of success (Van Teijlingen and Hundley, 2002). Forza (2002) suggests that the pre-testing of the questionnaires should be conducted involving: colleagues, who may test whether the questionnaires help to achieve the objectives of the research study; context experts, who may verify the inclusion of avoidable obvious questions that demonstrate the ignorance of the researcher in some specific issue; and key respondents, who may provide feedbacks on the correct understanding of the questions and everything that can affect the answer.

In this study, once two questionnaires were translated and prepared by the author, both questionnaires were reviewed by colleagues and the mid-level managers, whose mother tongue is Italian, in order to ensure the correct translation and interpretation of the questionnaire developed by Farris et al. (2009). After of that, a pilot test was executed engaging key employees (10 respondents) of both organization to ensure the coherence, clarity and legibility of the both the instructions and the questions. Most of the key employees' feedbacks were related to the understanding of the questions. Based on these suggestions, the two questionnaires were refined and prepared to be distributed to the team members.

3.7. Survey execution

Once the pilot test activities and both questionnaires were refined in line with feedbacks and problems that were found at the pilot test, the survey execution phase was conducted

repeating the improved pilot test activities with all the sample. Essentially, the data were collected from the respondents (i.e., team members and lean facilitators) following the instructions on the protocol and using the both questionnaires.

Initially, 128 kaizen initiatives were identified as the sample. However, due to some of the team members that conducted these initiatives were fired or changed work, only 105 were considered as the final sample. Following the improved pilot-test activities and both questionnaires, the author and one of the mid-level manager of each healthcare organization distribute both questionnaires to the lean facilitators and the team members of each kaizen initiative. After a brief presentation of the research study to each team member and lean facilitators, the respondents were suggested to complete separately the data collection instrument as possible. In this way, the bias caused by the interaction with other team members and colleagues was reduced to minimum. The completed questionnaires were gathered within an envelope, which after being sealed, was sent to the lean facilitators and then to the author. Moreover, these facilitators assisted the authors when further information was necessary to be clarified about the improvement strategy of each healthcare organization.

In total, 605 surveys were provided to team members, and 362 were returned; hence, the response rate was 60%. Instead, 105 surveys were administered to the lean facilitators, and all 105 questionnaires were returned; thus, the response rate was 100%.

3.8. The data analysis process

When the data collection phase is ended, the information that was collected using the questionnaire should be transcribed to a computer database. In this way, eventual problems related to non-respondents can then be detected. Non-respondents can limit the generalisability of the results. In operations management discipline, the response rate should be greater than 50% (Flynn et al., 1990) to avoid bias issues. Furthermore, it is needed to control the transcription of the data from the original documents to a computer database, as about 2-4% of the data can be incorrectly transcribed (Swab and Sitter, 1974). Once these two phases of inputting and cleaning data were undertaken, the following step is the assessment of the measurement quality through the evaluation of the reliability and

validity of each measurement scale. The lack of validity introduces a systematic error (bias), while the lack of reliability introduces random error (Carmines and Zeller, 1979). In this way, it would be possible to ensure that the theoretical constructs have empirical referents (Forza, 2002), and to “disentangle the distorting influences of measurement errors on the theoretical relationships that are being tested” (Bagozzi et al., 1991).

In this study, the data collected from 105 kaizen initiatives were manually inserted into the spreadsheet developed to list the team members. The questionnaires were checked against the spreadsheet at least twice to control the accuracy of the data entry. The out of range responses were constantly verify using the Excel max and min functions. Initially, it was created two spreadsheets in excel to entry the data from each healthcare organization. Then, a master spreadsheet was created to get together all the data collected from both healthcare organizations (see appendix E for details of the spreadsheet).

Using the master spreadsheet, the data were further screened to remove individual questionnaires that shows evidence of systematic response bias, i.e. survey fatigue, based on the procedure proposed by Farris et al. (2009). As a result of this data screening, 10 questionnaires were removed. Furthermore, the missing values within the final database were completed using the mean of each team (Hair et al., 1998).

Using the final database, the goodness of the measures was verified in terms of validity (i.e., content validity, unidimensionality, convergent validity and discriminant validity) and reliability (i.e., Cronbach’s alpha value). In the following paragraphs the evaluation of each of these tests are described deeply.

3.8.1. Measurement quality

Content validity

Content validity refers to the subjective measurement of how well the items form a representative sample of the theoretical domain of the construct (Bagozzi and Foxall, 1996; Churchill, 1979; Nunnally, 1978), based on the literature review about determinant factors or enablers of social system outcomes of kaizen events, lean management implementation

and improvement initiatives in healthcare sector. The evaluation of content validity is a rational judgmental process not open to numerical evaluation, as this evaluation focuses on an extensive review of literature for the choice of the items and getting inputs from the practitioners and academic researchers on the appropriateness, completeness, etc. (Li et al., 2005). However, due to the dependence on the theoretical definition and perception of engaged judges, the content validity has limitations (Bollen, 1989).

In this study, the content validity was verified by reviewing publications that were written in English language in healthcare. A rigorous assessment was performed to select the contributions that fit the items of each measurement scale. The peer-reviewed studies that support the definition of each input factor, process factor and both social outcomes are listed in table 5, 6 and 7 respectively. In addition to literature review, healthcare practitioners with a great level in lean management were involved in a discussion to assess the content validity of the construct scales. Besides the assessment of the ease of completion, coherence and understandability of the measurement items in the pilot test, the content validity of each scale was tested. Based on the review of definitions and inputs from the engaged healthcare practitioners, the representativeness of the items of each measurement scale was positively verified.

Table 5: Content validity of input factors

Variable	Description	Author (s)
Goal clarity	“Lean improvement projects need well defined goals. Without a clear focus, “scope creep” can occur, and team members may feel overburdened and frustrated.”	Kim et al. (2009)
	“The clearer the team’s objectives, the higher the level of participation in the team”	Mickan (2005)
	“Low levels of goal clarity-that is, poor knowledge of causes, origins, and pathways of stress-would cause higher levels of strain due to accompanying feelings of uncertainty. Clear goals go hand in hand with lower levels of quantitative work overload and fewer problems in occupational collaboration.”	Elovainio and Kivimäki (1996)
Goal difficulty	“A complex intervention (care pathways) promote various facets of team working, including team communication, team relations, inter-professional documentation and staff knowledge.”	West and Lyubovnikova (2013)
	“The tendency may be to focus on fixing the common general (and complex and large) issue [...]. This would create an almost impossible, unfocused, and frustrating situation-a problem too large and diverse to get one’s arms around.”	Jimmerson (2007)

Table 5: continue

Variable	Description	Author (s)
Team autonomy	“The implementation of Lean production implied that employees took increased responsibility for improving and managing daily activities. The new role and participation in CI and problem solving has increased skill variety. Employees appreciated the increased responsibilities and autonomy to perform a wider variety of tasks, and felt respected and valued.”	Drotz and Poksinska (2014)
	“As the team went through the kaizen process, it generated a positive energy flow, resulting in creative ideas on how to change the present processes to reduce waste and enhance patient experience. The team had the autonomy to make changes in the organization and the ability to make changes in the organization. Furthermore, this relationship-building enhances overall communication within the organization.”	Bahensky et al. (2005)
Team functional heterogeneity	“Team compositional factors (high proportions of full time staff and longer team life) also predicted the effectiveness. A greater range of professional knowledge and experience provided team members with more opportunities for discussion and learning. As a consequence, teams reliably coordinated their services and, over time, improved their clinical performance.”	Mickan (2005)
	“Team composition benefits to complete the team task successfully. If anyone of these required disciplines is missing from the team composition, decision-making processes are likely to be dysfunctional.”	West and Lyubovnikova (2013)
Team leader and team kaizen experience	“When the leader taps into the collective knowledge of the team, he or she will be able to foster change because the team will understand the problem and the need for the change. If a leader approaches his or her team in a thoughtful and respectful way, the team will, in turn, be open to the leader’s guidance. This will create a desire to improve and a commitment to succeed.”	Kimsey (2010)
Management support and Initiative planning process	“To enable the availability of resources to ensure the progress of lean initiatives engenders the required behaviors of all staff to affect the necessary cultural changes needed for lean.”	Al-Balushi et al. (2014)
	“To secure maintenance, a hospital depends first and foremost on a supportive culture characterised by norms, beliefs and behaviours supporting the principles and practice of quality improvement. In a supportive culture, employees feel that they can make use of their skills and creativity, take initiative and cause things to happen.”	Andersen et al. (2014)
Work area routineness	“A context where there are variations in work processes or an absence of routines, these methods enable problem solvers to recognise and diagnose the problems and to determine how they cause variation and ambiguity.”	Mazzocato et al. (2010)
	“Basic stability is absolutely essential to create the proper learning environment where employees can see clearly the impact of their actions and then learn through the kaizen activities, not simply make the problems go away. turn workers into problem-solvers.”	Ballé and Régnier (2007)

Table 6: Content validity of process factors

Variable	Description	Author (s)
Action Orientation	“The real-time involvement of staff who identify problems, and their input into the current condition and ideas for a better way to work, motivated the staff beyond our initial anticipation.”	Jimmerson et al. (2005)
	“Our interviewees reported that Lean is ultimately learned through hands-on experience. Give someone a fish, feed them for a day; teach someone to fish, feed them for a lifetime.”	Fine et al. (2009)
Affective commitment to change	“Commitment of the clinic staff to process improvement and a willingness to implement the revised process was critical to the success of the project. In fact, the reduction in lead time meant that the overall care team had full knowledge of the patient care plan almost two weeks earlier than before.”	Laureani et al. (2013)
	“Affective and normative commitment are associated with higher levels of support behaviour.”	Herscovitch and Meyer (2002)
Internal processes	“The team dynamics enabled it to obtain solutions through a free exchange of ideas. Furthermore, this relationship-building enhances overall communication within the organization.”	Bahensky et al. (2005)
	“High-functioning teams have been characterized as having positive communication patterns; low levels of conflict; and high levels of collaboration, coordination, cooperation, and participation. These processes are positively associated with perceived team effectiveness.”	Lemieux-Charles and McGuire (2006)
Tool quality and Tool appropriateness	“Success of our intervention depended on a systematic approach of developing a quality assurance program (TPS) that moved research into practice. The continued improvement had become more ingrained in provider behaviour.”	Raab et al. (2006)
	“Efficacy might have improved if healthcare staff adhered more strictly to the lean pathway design. Behaviour of ophthalmologists deviated from decision rules. Presenting the deviation, we found may rationalise discussions on behaviour in medical decision-making.”	Van Vliet et al. (2010)

Table 7: Content validity of social outcomes

Variable	Description	Author (s)
Kaizen capabilities	“We must keep in mind what the Kaizen event is supposed to achieve. It is one thing to generate solution ideas, and while this may indeed be one of the key outputs from the event, the end goal and what should be the motivating force is and should remain enacting some beneficial change within the organisation”	Natale et al. (2014)
	“The outcomes from the Lean initiatives can be divided into two broad areas: one set relates to the performance of the healthcare system, while the second relates to the development of employees and work environment. [...]. One of the most frequently mentioned outcomes in this set is increased attention of employees to waste and more proactive attitude to problem solving. Staff stops assuming that waste is part of their work and doesn't accept workarounds and fire fighting anymore, but instead takes initiative to resolve problems.”	Poksinska (2010)
	“Lean offers methods [...] enable problem solvers to recognise and diagnose the problems and to determine how they cause variation and ambiguity. Developing a shared understanding of what is important helps members of different professions to communicate and see how their roles and their work relate to the bigger picture”	Mazzocato et al. (2010)
Attitude	“Lean Healthcare offers employees more responsibility, greater involvement, and a sense of ownership in their work.”	Poksinska (2010)
	“This result suggests that employees who are given the opportunity to build their skills and competence are more likely to develop a greater sense of confidence and the job satisfaction.”	Lee and Bruvold (2003)

Unidimensionality

Following the data screening, confirmatory factor analysis (CFA) was conducted to validate whether the proposed items reflect one, as opposed to more than one, underlying theoretical construct (Li et al., 2005; Anderson and Gerbing, 1988). This unidimensionality was assessed using LISREL 8.80 software. Particularly, the unidimensionality of the constructs with fewer than four items were assessed using two-construct model. The second construct was employed as a common basis of reference to have sufficient degrees of freedom (Li et al., 2005). To evaluate the construct model fit of each scale, the most commonly reported fit indexes in literature, i.e., the Good fit index (GFI) and Comparative fit index (CFI) and Root Mean Square Residual (RMR), were evaluated (Li et al., 2005; McDonald and Ho, 2002). Additionally, an iterative modification process, based on CFA, were conducted to refine the model fit indexes. In this study, the GFI, CFI and RMR values relating to each scale meet the cut-off point, providing cogent evidence of unidimensionality. Table 8 presents the results of the assessment of unidimensionality.

Table 8: Confirmatory factor analysis and reliability analysis

Construct	d.f.	RMR ^a	GFI ^b	CFI ^c
Goal Clarity (GC)	2	0.014	0.991	0.996
Goal difficulty (GD)	36	0.051	0.908	0.962
Team autonomy (TA)	2	0.031	0.970	0.975
Management support (MS)	43	0.045	0.903	0.969
Action orientation (AO)	43	0.043	0.913	0.971
Internal processes (IP)	5	0.155	0.979	0.992
Affective commitment to change (ACC)	5	0.044	0.944	0.964
Kaizen capabilities (KC)	20	0.044	0.904	0.968
Attitude (AT)	43	0.053	0.829	0.992
^a The Root Mean Square Residual (RMR) should not be greater of 0.05 to indicate a fair fit (Li et al., 2005; Bryne, 1989). ^b The Good Fit Index (GFI) indicates the relative amount of variance and covariance explained by the model. This index should be greater than 0.8 to indicate reasonable fit (Li et al., 2005; Chau, 1997). ^c The Comparative Fit Index (CFI) ensures that a misspecified model is not accepted, a value of CFI \geq 0.95 indicates a good fit (Hu and Bentler, 1999)				

Reliability

The reliability test aims to verify the extent to which a measuring procedure yields the same results on repeated trials (Forza, 2002; Carmines and Zeller, 1979). After a scale was found

to be unidimensional, its reliability was assessed considering the Cronbach's coefficient alpha which demonstrates the internal consistency or correlation of items of a given scale (Cronbach, 1951).

In this study, the reliability analysis of each construct was satisfactory verifies as the Cronbach α values of most of the scales exceed the recommended threshold of 0.70 (Nunally, 1978), except for Goal Difficulty and Action orientation, although they still meet the acceptable cut-off point of 0.6 (Hair et al., 1998; Bullinger et al., 1996). The Cronbach α values are reported in table 9.

Convergent validity

The convergent validity test aims to verify whether the set of items constituting a measure faithfully represents the set of aspects of the theoretical construct measured, and does not consist of items which represent aspects not included in the theoretical construct (Forza, 2002). To assess the convergent validity between measures (or items) of same constructs, we look at each item in the scale as a different approach to measure the construct and determine if they are convergent (Li et al., 2005). Convergent validity refers to all items measuring a construct load on a single construct due to they should necessarily be highly correlated (Campbell and Fiske, 1959). In this study, the convergent validity was tested verifying that the factor loadings of constructs are greater than 0.5 (Anderson and Gerbing, 1988) and are statistically significant at the 0.05 level. In table 9, the convergent validity of each scale was positively demonstrated for all measurement items of the scales.

Table 9: Factor loadings of scale items

	Item	Factor loading	Standard Error	Cronbach's alpha ^a
Kaizen capabilities (KC)	KC1	0.841	0.293	0.928
	KC2	0.699	0.511	
	KC3	0.702	0.507	
	KC4	0.632	0.600	
	KC5	0.805	0.352	
	KC6	0.859	0.263	
	KC7	0.871	0.242	
	KC8	0.733	0.463	
Attitude (AT)	AT1	0.823	0.322	0.817
	AT2	0.794	0.370	
	AT3	0.686	0.529	
Internal processes (IP)	IP1	0.791	0.374	0.925
	IP2	0.881	0.223	
	IP3	0.900	0.190	
	IP4	0.862	0.257	
	IP5	0.782	0.389	
Affective commitment to change (ACC)	ACC1	0.710	0.496	0.879
	ACC2	0.743	0.448	
	ACC4	0.830	0.311	
	ACC5	0.808	0.346	
	ACC6	0.757	0.427	
Action orientation (AO)	AO1	0.634	0.598	0.588
	AO2	0.505	0.745	
	AO3	0.569	0.676	
Goal clarity (GC)	GC1	0.902	0.186	0.897
	GC2	0.836	0.302	
	GC3	0.847	0.282	
	GC4	0.738	0.455	
Goal difficulty (GD)	GD2	0.885	0.218	0.672
	GD3	0.920	0.930	
Team autonomy (TA)	TA1	0.776	0.397	0.853
	TA2	0.902	0.186	
	TA3	0.866	0.25	
	TA4	0.537	0.712	
Management support (MS)	MS1	0.865	0.252	0.705
	MS2	0.734	0.461	
	MS5	0.504	0.746	
*The Cronbach α -values ≥ 0.7 are enough to guarantee the reliability of the scale (Cronbach, 1951; Nunnally, 1978).				

Discriminant validity

Discriminant validity represents the extent to which measures of a given construct differ from measures of other constructs in the same model (Forza, 2002; Hulland, 1999). In this study, the discriminant validity was evaluated according to the delta Chi-square test (Bagozzi et al., 1991; Venkatraman, 1989). Two CFA were conducted on pairs of two constructs. The first CFA assesses the unconstrained correlation between the two constructs whereas the second CFA evaluates the constrained correlation (Ahire et al., 1996). This procedure was repeated for all pairs of perceptual scales of questionnaire 1. A total of 28 discriminant validity checks were run to calculate the difference of Chi-square values between the models. In table 10, the values of delta Chi-square are reported. These values ranged from 0.052 to 437.00 and were statistically significant at the 0.05 level confirming that these scales were distinct from each other.

Table 10: Discriminant validity

Description	Unconstrained		Constrained		Difference	Unconstrained		Constrained	
	d.f.	Chi-square	d.f.	Chi-square		GFI	AGFI	GFI	AGFI
KC with AT	43	370.4	44	808.176	437.743	0.829	0.738	0.792	0.688
KC with IP	64	221.093	65	391.121	170.028	0.908	0.87	0.868	0.815
KC with ACC	64	260.888	65	524.724	263.836	0.889	0.842	0.838	0.773
KC with AO	43	172.115	44	277.976	105.861	0.913	0.866	0.877	0.816
KC with GC	53	209.9	54	410.065	200.174	0.901	0.855	0.851	0.784
KC with GD	36	174.3	37	176.4	2.146	0.908	0.859	0.907	0.862
KC with TA	53	286.176	54	425.891	139.715	0.881	0.826	0.847	0.779
KC with MS	43	183.53	44	261.001	77.471	0.903	0.851	0.878	0.817
AT with IP	19	55.7	20	200.647	144.947	0.961	0.927	0.897	0.815
AT with ACC	19	77.521	20	304.129	226.608	0.946	0.898	0.858	0.745
AT with AO	8	13.858	9	80.086	66.228	0.987	0.967	0.937	0.853
AT with GC	13	43.465	14	230.081	186.616	0.967	0.928	0.874	0.748
AT with GD	6	11	7	11.052	0.052	0.988	0.969	0.988	0.973
AT with TA	13	83.117	14	172.341	89.224	0.938	0.867	0.892	0.785
AT with MS	8	21.639	9	87.458	65.819	0.981	0.949	0.932	0.84
IP with ACC	34	136.654	35	327.036	190.382	0.929	0.884	0.872	0.798
IP with AO	19	59.503	20	164.137	104.634	0.961	0.926	0.911	0.839
IP with GC	26	71.43	27	284.04	212.61	0.957	0.925	0.883	0.805
IP with GD	15	36.776	16	37.805	1.029	0.972	0.947	0.971	0.949

Table 10: continued

Description	Unconstrained		Constrained		Difference	Unconstrained		Constrained	
	d.f.	Chi-square	d.f.	Chi-square		GFI	AGFI	GFI	AGFI
IP with TA	26	99.745	27	227.83	128.085	0.943	0.9	0.892	0.821
IP with MS	19	48.638	20	89.768	41.13	0.970	0.942	0.946	0.902
ACC with AO	19	87.635	20	190.401	102.766	0.938	0.882	0.892	0.805
ACC with GC	26	123.143	27	319.165	196.022	0.929	0.877	0.863	0.772
ACC with GD	15	66.825	16	72.594	5.769	0.949	0.905	0.945	0.904
ACC with TA	26	110.97	27	224.433	113.463	0.934	0.886	0.886	0.811
ACC with MS	19	74.459	20	144.796	70.337	0.942	0.902	0.912	0.841
AO with GC	13	23.136	14	125.026	101.89	0.982	0.96	0.92	0.84
AO with GD	6	20.678	7	25.219	4.541	0.977	0.943	0.973	0.943
AO with TA	13	54.225	14	204.462	150.237	0.958	0.909	0.883	0.766
AO with MS	8	13.445	9	48.72	35.275	0.988	0.968	0.959	0.905
GC with GD	10	23.685	11	28.856	5.171	0.979	0.956	0.975	0.952
GC with TA	19	91.123	20	169.823	78.7	0.940	0.887	0.904	0.827
GC with MS	13	39.066	14	76.123	37.057	0.969	0.934	0.945	0.89
GD with TA	10	49.582	11	50.331	0.749	0.957	0.91	0.957	0.917
GD with MS	6	17.119	7	17.866	0.747	0.982	0.954	0.981	0.959
TA with MS	13	38.168	14	126.625	88.457	0.970	0.936	0.916	0.832

3.8.2. Aggregation of data to team-level

As in this study the unit of analysis is the team, it is needed to verify whether the data could justifiably be aggregated to the team level because the data were collected at individual level to reduce potential presence of bias. These properties were evaluated considering the intraclass correlation coefficient (ICC) (1) (Molleman, 2005) and the interrater agreement (rwg) (James et al. 1984, 1993) values for each construct.

Following Farris et al. (2009), the intraclass correlation coefficient (ICC) was calculated using the Bartko (1976) formulation. The between-team mean square (MSB), the within-team mean square (MSW) and average team size (k) were assessed from analysis of variance (ANOVA). Due to the nested structure of data (teams within organizations), a nested significant ANOVA with team as the main predictor was undertaken to indicate that ICC (1) is significant (Jetten et al., 2002; Bliese, 2000; Klein and Kozlowski, 2000). In this way, it can be ensured that the variance of individual responses was a function of group membership (Bliese, 2000). The ICC (1) of each study variable was evaluated

considering the cut-off values of 0.20 and below 0.10 to indicate strong or weak team level properties respectively (Molleman, 2005). As table 11 indicates, all variables had significant ICC (1) values that are between 0.18 and 0.30 demonstrating the strong team level properties for each one.

Additionally, interrater agreement (r_{wg}) for each revised scale was evaluated considering both the average r_{wg} and the proportion of teams with r_{wg} greater than 0.70 were analyzed. This threshold indicates a strong within-group agreement (Klein and Kozlowski, 2000). For each variable, both the average r_{wg} (Avg. r_{wg}) and the ratio of teams with r_{wg} greater than 0.7 was calculated. As table 11 shows, all variables had Avg. r_{wg} value greater than 0.70 and further had at least 70% of individual team r_{wg} values greater than 0.70. The overcome of the threshold of both ICC and r_{wg} allowed to conclude that there are strong team level properties.

Table 11: Psychometric properties of the multi-item scales

Scale	ICC (p)	Avg. r_{wg}	Proportion $r_{wg} > 0.70$
Goal Clarity (GC)	0.18 (<0.000)	0.941	0.971
Goal difficulty (GD)	0.22 (<0.000)	0.761	0.743
Team autonomy (TA)	0.29 (<0.000)	0.861	0.857
Management support (MS)	0.23 (<0.000)	0.772	0.705
Action Orientation	0.18 (<0.000)	0.796	0.781
Internal processes (IP)	0.19 (<0.000)	0.929	0.943
Affective commitment to change (ACC)	0.21 (<0.000)	0.917	0.952
Kaizen capabilities (KC)	0.29 (<0.000)	0.949	0.971
Attitude (AT)	0.30 (<0.000)	0.888	0.914

Furthermore, the normal distributions of all variables were verified for all variables before the evaluation of the hypotheses (H2.1 and H2.2). The assumption of the normality is relevant to conduct parametric analyses (i.e., regression analysis). Therefore, variables that are strongly non-normal distributed should be transformed otherwise parametric assessment could not be performed (Hair et al., 1998; Neter et al., 1996).

In this study, the assessment of the normal distribution of the variables were verified using the z-values of skewness and kurtosis ($z < 3.29$) (Kim, 2013) and the graphical method. It was found that the distribution of the variables demonstrates non-severe departures from normality distribution, except for the following variables: team leader experience, team

kaizen experience and even planning process. To respect the normal assumption, a log transformation was run to normalize the data and control for the skewness of the distribution in order to prepare them for subsequent analysis.

The assessment of the hypothesis following a parametric analysis is explained in the following chapter. Based on these empirical findings, it will be developed the interpretation and final contributions of this study.

CHAPTER IV: RESULTS

4.1. Overview of the models to test the hypotheses

To answer the research questions, multiple regression was used to assess the significant relationships between input, process factor and social outcomes. The modelling process used to test the hypotheses was as follows:

1. To identify the most significant determinant factors of social outcomes, i.e., H2.1 and H2.2, regression analyses was conducted considering as control variables the team size and the typology of organization.
2. To identify the direct and indirect effects of input on each social outcome through process factors, i.e., H2.3, mediation models were analysed for any process factor.

4.2. Regression analysis

To investigate the relationship between predictors and both social outcomes, multiple regression analysis was used because it allows to model statistically the relationship between dependent variable and a set of independent variable. In social science, regression analysis is a powerful tool as it allows to explain the causal influence on dependent variable a population outcome (Jeon, 2015). As many of the variables are inter-correlated, the predictor selection procedure is important to adequately run a regression analysis. Several strategies for variable selection (e.g., all possible regressions, forward selection backward elimination, stepwise procedure) can be followed to yield the best regression model (Xu and Zhang, 2001). Furthermore, the following four assumption should be tested to provided robust explanation about the causal relationship between independent variable and dependent variable. These assumptions are:

- Linearity of the phenomenon measured
- Constant variance of the error terms
- Independence of the error terms
- Normality of the error term

4.2.1. Screening analysis prior to building regressions models

Before building the regression models, a data screening process was conducted to verify whether the basic assumptions of linear regression are violated. This screening process involves checking the existence of multicollinearity among the data related to the regressor variables (i.e., the input and process factors and the social outcomes), as it affects the estimated coefficients in a multiple regression analysis.

To assess the multicollinearity issues, the Variance inflation factor (VIF) was used because it assesses the extent to which a given predictor covaries with all the other predictors in the model – i.e., the extent to which the variance of the given predictor can be predicted by the other predictors (O'brien, 2007; Mansfield and Helms, 1982). The VIF is calculated using the following equation:

$$VIF = \frac{1}{1 - R_k^2}$$

Where R_k^2 is the R^2 value when a predictor is regressed on the other predictor variables. To test VIF, a common rule of thumb is that individual VIF value of 10 or greater indicates a problem with multicollinearity, as does an average VIF substantially greater than three. In table 13, the VIF values are calculated with values ranging between 1.103 and 2.924 and the average VIF value of 2.085.

Based on these findings (See table 12), it appears that multicollinearity is not severe problem in the current regression modelling process, allowing to separately build the regression models for each social outcome variables: the kaizen capabilities and the attitude.

Table 12: VIF for input and process factors

Predictor	VIF
Goal clarity	2.833
Goal difficulty	1.259
Team autonomy	2.439
Management support	1.832
Team kaizen experience	2.320
Team functional heterogeneity	1.103
Initiative planning time	1.675
Work area routineness	1.422
Team leader experience	2.299
Affective commitment to change	2.924
Internal processes	2.625
Action orientation	2.247
Tool quality	2.012
Tool appropriateness	2.198
Average VIF	2.085
Max VIF	2.924

4.2.2. Model building process

The model building process was carried out following an exploratory approach as there is not sufficient literature support that indicates which, among the 14 predictors, are the most strongly determinants associated to the two social outcomes of kaizen initiatives in healthcare. Additionally, as the kaizen initiatives were performed in two hospitals with different locations, it was controlled that the effect of the type of organization on both social outcomes. Moreover, it was controlled that the kaizen team size as the number of participants may influence the social outcome. Therefore, organization type and team size were considered as control variables.

Although many scholar have been studying the lean management implementation in healthcare using kaizen initiatives, there is lack of previous work that contemporarily assesses the relationships between the social contribution of kaizen initiatives and their predictors following an empirical field approach. To date, scholars just argue that each of the 14 predictor variables are relevant determinants of the improvement of the social

outcomes of the kaizen initiatives performed in a healthcare setting based mainly on anecdotal experiences or non-robust empirical support. Therefore, the exploratory variable selection approach was adopted as the strategy to identify the most significant determinants of the social outcomes.

Furthermore, the exploratory selection procedure was conducted following a backward selection procedure to iteratively narrow the set of independent predictor variables of each social outcomes. This backward selection procedure was adopted instead of a forward one because it is less likely to result in the exclusion of important variables than a forward or stepwise selection procedure (Jeon, 2015; Xu and Zhang, 2001; Neter et al., 1996). The backward selection procedure started by inserting all of the 14 candidate predictor variables into the model together to the control variables. At each stage, the independent variable with the highest p-value was removed until all remaining variables were significant at 0.05 level. In this way, it was identified which among the independent variables are the most significant determinants of each social outcome.

In the following two sections, the results of the model building process for each of the two social outcomes variables is described receptively.

4.2.3. Model of kaizen capabilities

Using the backward selection procedure to achieve the purpose of identifying the most significant determinants of the kaizen capabilities outcomes, the final solution is presented in table 13. It was found that goal clarity, management support, team autonomy and affective commitment to change variables are significantly associated with the kaizen capabilities (KC). Furthermore, the two control variables were not found significantly related to both outcomes. Additionally, it was found that the values of the R^2 and the adjusted R^2 were greater than 0.5 demonstrating the great proportion of the variance in the dependent variable (i.e., kaizen capabilities) that is predictable from the independent variables.

Table 13: Most influential factors of kaizen capabilities

Variable	Model 1 (y = KC)	
	β	p
Intercept	-3.410	0.073
Organization type	0.619	0.361
Team size	0.185	0.084
Goal clarity	0.459	0.000**
Management support	0.122	0.029*
Team autonomy	0.194	0.001**
Affective commitment to change	0.250	0.003**
R ²	0.855	
R ² adjusted	0.731	
p-value: * < 0.05; **<0.01		

Based on the final model of kaizen capabilities and considering the typology of predictor variables, both hypotheses (H2.1 and H2.2) of the direct effect of input and process predictors are partially supported as the kaizen capabilities outcomes are significantly predicted by at least one input factor and one process factor.

4.2.4. Model of Attitude

The model building process of the attitude, following the backward selection procedure, produced the following solution: *goal clarity*, *management support*, *team autonomy* and *goal difficulty*. This final model is reported in table 14. Similarly, the two control variables were not found significantly related to both social outcomes. Additionally, both R² and the adjusted R² values are reported, indicating the great level of variance in the dependent variable that is explained by the independent variables.

Based on the final model of attitude and considering the typology of direct predictor variables, only hypothesis one (H2.1) of the direct effect of input predictors is partially supported as this social outcome is significantly predicted by at least one input factor. Conversely, hypothesis two (H2.2) of the direct effect of process predictors on the attitude outcome is not supported as no process factor was found as significant predictor.

Table 14: Most influential predictors of attitude

Variable	Model 2 (y = AT)	
	β	p
Intercept	-2.929	0.239
Organization type	0.634	0.477
Team size	0.075	0.590
Goal clarity	0.724	0.000**
Management support	0.208	0.002**
Team autonomy	0.160	0.032*
Goal difficulty	-0.124	0.026*
R ²	0.799	
R ² adjusted	0.639	
p-value: * < 0.05; **<0.01		

4.2.5. Mediation analysis

Apart from identifying the most significant predictors of both social outcomes, it was also evaluated the mechanism whereby input factors are associated with the social outcomes through the process factors. In order to test the statistical significance of these mechanisms, which were developed based on the input-process-outcome framework (Guzzo and Shea, 1992; McGrath, 1964), the mediation analysis was conducted following the modified version of Baron and Kenny (1986) classic approach described by Farris et al. (2009) without considering the control variables as they were not significantly related to the social outcomes in the previous regression analysis.

Indeed, the mediation analysis aims to explain the mechanism that underlies a causal relationship between an independent variable “X” and a dependent variable “Y” through the addition of a third variable called mediating variable “M” (Baron and Kenny, 1986). Mediation in its simplest form is represented in figure 12 using the most widely notation where the variables X, M, and Y are in rectangles and the arrows represent relations among variables. Specifically, “a” represents the relation of X to M, “b” represents the relation of M to Y adjusted for X, and c’ the relation of X to Y adjusted for M. Additionally, it is important to distinguished between the terms *moderator* and *mediator*. A mediator is a variable that is in a causal sequence between two variables, whereas a moderator is not part of a causal sequence between the two variables (Mackinnon et al., 2007). For more details

on the distinction among the definitions of these variables see Robins and Greenland (1992).

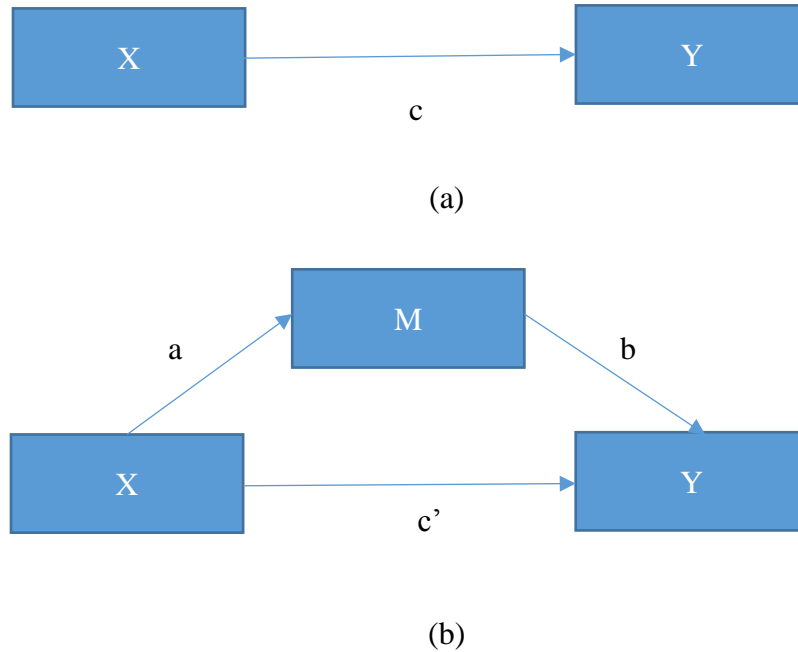


Figure 12: The simplest form of mediation (Kenny et al., 1998)

Some scholars (e.g., Mackinnon et al., 2000; Baron and Kenny, 1986) argue that mediation analysis is valid if the direction of the set of hypothesised causal relationships between the independent variable “X”, the mediating variable “M” and the dependent variable “Y” are valid. However, as this study is an observational one, it may be impossible to totally exclude any possibility of different causal relationships than these previously assumed. To face this problematic, Mackinnon et al. (2000) suggest that the fact that a hypothesised mediation relationship is not demonstrated supports the conclusion that this hypothesised model is not correct, conversely, if the hypothesised mediation relationship is found, this reveals that the proposed causal model could be correct and warrant further investigation-preferably through involving additional experimental controls (Farris et al., 2009).

In the current research, it is hypothesised that the effects of input factors on the social outcomes are mediated through the following process factors: affective commitment to

change, internal processes, action orientation, tool quality and tool appropriateness. Often, the procedure to conduct the mediation analysis is based on method proposed by Judd and Kenny (1981) and Baron and Kenny (1986). These scholars proposed a method of four steps to evaluate the relationships that includes the testing of all four paths – a, b, c, and c' (See figure 12). However, Farris et al. (2009) found that some authors (e.g., Kenny et al., 1998) demonstrated that only the assessment of the significance of path a and path b are sufficient to demonstrate the mediation. Furthermore, Farris et al. (2009) add a final step to confirm the significant relationship between the independent variable and the mediator a simultaneous regression is conducted between all significant independent variables. The steps to conduct a mediation analysis according to Farris et al. (2009) are:

1. Step 1: To conduct separate regressions aimed to identify the significant relationships between each independent variable (i.e., input factor) on each mediating variable (i.e., process factor). In this way, the path a are assessed.
2. Step 2: If a significant relationship was found in step 1, each social outcome was regressed on both the process and input factor. If the process factor is significantly related to a social outcome (path b), there is a mediation effect of the process variable. Besides, if the input factor is significantly related to the social outcomes (path c'), the effect of the input factor on the social outcome is partially mediated, otherwise it is fully mediated.
3. Step 3: Once the two previous steps were carried out for all nine inputs, it is needed to regress each mediating variable (i.e., process factor) on all the significant independent variables (i.e., input factors) that were found in step 1 and 2 to confirm whether these variables are still significant when they are simultaneously regressed.

Additionally, to support the previous mediation effects, it was assessed the significance of the indirect effects and their confidence intervals (CIs) assessing the z-value and considering that the distribution of the indirect effects is normal. However, as this assumption could be biased, it was also verified the significance of these indirect effects and their asymmetrical confidence intervals (CIs) using PRODCLIN (Mackinnon et al., 2007) to provide more accurate estimates of CIs for each indirect effect. It was checked

that these indirect effects had z-values greater than 1.96 and the 95% confidence intervals excludes zero, which allows to confirm the significance of the indirect relationships that were found in previous analysis, thus, H3 can be supported

4.2.6. Mediation analysis for attitude

Following the steps proposed by Farris et al. (2009) for the mediation analysis, it was found that just affective commitment to change, internal processes and action orientation mediates the effect of some input factors on the attitude factor.

Indeed, by performing the first step of the mediation analysis, each process factor was separately regressed on all nine input factors to identify which among these factors are significantly related to each process factors at the $\alpha = 0.05$ level. The results of these separate regressions are shown in table 15.

By considering the significant determinants of each process factor, the step 2 of the mediation analysis was performed. It was found that affective commitment to change (ACC) partially mediates the effect of goal clarity, goal difficulty and management support on the attitude variable. Besides, internal processes (IP) factor only partially mediates the effect of team autonomy on the attitude outcome. Finally, action orientation (AO) partially mediates the effect of management support on the employee's attitude. Conversely, the tool quality and tool appropriateness do not mediate the effects of input factor on the attitude outcomes. The results of these separate regressions are shown in table 15, 16, 17. In each table, parameter estimates and their p-values are only reported to identify the significant relationships between input and process factors (i.e., path "a"), the significant indirect relationship between input and process factors through the mediating variables (i.e., path "b" and "c" respectively).

Furthermore, it was test the significance of the above indirect relationships using its z-values and its asymmetric confidence interval. As table 18 shows, all of the aforementioned indirect relationships are significant with z-values greater than 1.96 and the exclusion of the zero within the low level of confidence interval and the upper level of confidence interval.

Table 15: Mediation analysis results for regressions between inputs and process factors

Step 1 (z = mediator)	z = ACC	z = IP	z = AO	z = TQ	z = TAP
Separate regression	a (p-value)	a (p-value)	a (p-value)	a (p-value)	a (p-value)
Goal clarity	0.758 (0.000)**	0.758 (0.000)**	0.569 (0.000)**	0.003 (0.978)	0.068 (0.716)
Goal difficulty	0.175 (0.018)**	0.055 (0.451)	0.089 (0.233)	0.203 (0.022)*	0.218 (0.092)
Team autonomy	0.397 (0.000)**	0.450 (0.000)**	0.609 (0.000)**	0.141 (0.183)	0.294 (0.056)
Management support	0.452 (0.000)**	0.180 (0.029)**	0.216 (0.009)**	-0.161 (0.111)	-0.143 (0.332)
Team kaizen experience	3.031 (0.281)	0.769 (0.780)	5.600 (0.043)	-4.882 (0.144)	5.486 (0.260)
Team functional heterogeneity	2.378 (0.394)	4.184 (0.123)	-1.194 (0.666)	-2.152 (0.517)	-3.770 (0.436)
Initiative planning processes	-2.133 (0.192)	0.052 (0.974)	-0.312 (0.847)	8.091 (0.000)**	16.093 (0.000)**
Work area routineness	0.009 (0.902)	0.046 (0.521)	0.095 (0.192)	0.316 (0.000)**	0.178 (0.164)
Team leader experience	2.059 (0.316)	0.210 (0.917)	3.106 (0.124)	-6.663 (0.005)**	-4.767 (0.179)
p-value: * < 0.05; **<0.01					

Table 16: Mediation analysis results for between inputs and process factors and social outcomes.

Step 2 (y = social outcome); separate regression	y = AT	
	b (p-value)	c' (p-value)
<i>Affective commitment to change</i>	0.271 (0.007)**	
Goal clarity		0.692 (0.000)**
<i>Affective commitment to change</i>	0.756 (0.000)**	
Goal difficulty		-0.160 (0.015)
<i>Affective commitment to change</i>	0.560 (0.000)**	
Team autonomy		0.306 (0.002)**
<i>Affective commitment to change</i>	0.579 (0.000)**	
Management support		0.214 (0.012)
<i>Internal processes</i>	0.197 (0.065)	
Goal clarity		0.748 (0.000)**
<i>Internal processes</i>	0.524 (0.000)**	
Team autonomy		0.293 (0.001)*
<i>Internal processes</i>	0.599 (0.000)**	
Management support		0.368 (0.000)**

Table 16: continued

Step 2 (y = social outcome); separate regression	y = AT	
	b (p-value)	c' (p-value)
<i>Action orientation</i>	0.032 (0.722)*	
Goal clarity		0.880 (0.000)**
<i>Action orientation</i>	0.107 (0.405)**	
Team autonomy		0.463 (0.000)**
<i>Action orientation</i>	0.339 (0.000)**	
Management support		0.402 (0.000)**
<i>Action orientation</i>	0.450 (0.000)**	
Team kaizen experience		1.117 (0.704)
<i>Tool quality</i>	0.028 (0.657)	
Goal difficulty		0.898 (0.000)**
<i>Tool quality</i>	0.052 (0.611)	
Initiative planning time		-1.062 (0.597)
<i>Tool quality</i>	0.056 (0.571)	
Work area routineness		-0.066 (0.451)
<i>Tool quality</i>	0.056 (0.561)	
Team leader experience		2.399 (0.313)
<i>Tool appropriateness</i>	0.050 (0.513)	
Initiative planning time		-1.451 (0.511)
p-value: * < 0.05; **<0.01		

Table 17: Simultaneous regression of input factors on each significant mediator

Step 3 (z = process factor) Simultaneous regression	AT	AT	AT
	z = ACC	z = IP	z = AO
Goal clarity	0.572 (0.000)**		
Goal difficulty	0.107 (0.035)*		
Management support	0.258 (0.000)**	0.036 (0.642)	0.200 (0.015)*
Team autonomy	0.065(0.347)	0.437 (0.000)**	
Team kaizen experience			4.858 (0.073)
p-value: * < 0.05; **<0.01			

Table 18: Significant mediation results

Indirect effect model	z-value	Asymmetrical distribution		Normal distribution	
		LLCI	ULCI	LLCI	ULCI
GC->ACC->AT	2.628	0.057	0.365	0.052	0.358
GD->ACC->AT	2.316	0.024	0.250	0.020	0.244
MS->ACC->AT	4.295	0.152	0.391	0.142	0.382
TA->IP->AT	3.933	0.130	0.362	0.118	0.354
MS->AO->AT	2.086	0.015	0.151	0.004	0.142
Note: z-value: if the Z score is between -1.96 and +1.96, the p-value will be larger than 0.05, accepting the null hypothesis. Moreover, the mediation effect is significant if the 95% confidence interval between lower level confidence interval (LLCI) and upper level confidence interval (ULCI) excludes zero (Mackinnon et al., 2007).					

4.2.7. Mediation analysis for kaizen capabilities

In what respect the mediation effects on the kaizen capabilities, it was considered the output from table 13 for all process factors, as the path “a” calculations are the same.

By performing the step 2 of the mediation analysis, it was found that also the affective commitment to change, internal processes and action orientation mediates the effect of some input factors on the kaizen capabilities variable. Specifically, it was found that affective commitment to change partially mediates the effects of goal clarity, goal difficulty and management support on the kaizen capabilities outcomes. Moreover, internal processes factor partially mediates the effects of team autonomy on the kaizen capabilities outcomes. Finally, action orientation partially mediates the effects of goal clarity and team autonomy on the kaizen capabilities outcomes. These results are shown in table 19 and 20.

Furthermore, the significance of the aforementioned indirect relationships was tested by assessing the z-values and its asymmetric confidence interval. As table 21 shows, all of the aforementioned indirect relationships are significant with z-values greater than 1.96 and the exclusion of the zero within the low level of confidence interval and the upper level of confidence interval.

Table 19: Mediation analysis results for between inputs and process factors and social outcomes.

Step 2 (y = social outcome); Separate regression	y = KC	
	b (p-value)	c'(p-value)
<i>Affective commitment to change</i>	0.385 (0.000)**	
Goal clarity		0.539 (0.000)**
<i>Affective commitment to change</i>	0.747 (0.000)**	
Goal difficulty		-0.074 (0.153)
<i>Affective commitment to change</i>	0.586 (0.000)**	
Team autonomy		0.288 (0.000)**
<i>Affective commitment to change</i>	0.627 (0.000)**	
Management support		0.162 (0.015)*
<i>Internal processes</i>	0.108 (0.233)	
Goal clarity		0.749 (0.000)**
<i>Internal processes</i>	0.411 (0.000)**	
Team autonomy		0.336 (0.000)**
<i>Internal processes</i>	0.514 (0.000)**	
Management support		0.353 (0.000)**
<i>Action orientation</i>	0.211 (0.004)**	
Goal clarity		0.711 (0.000)**
<i>Action orientation</i>	0.299 (0.006)**	
Team autonomy		0.339 (0.001)**
<i>Action orientation</i>	0.452 (0.000)**	
Management support		0.348 (0.000)**
<i>Action orientation</i>	0.550 (0.000)**	
Team kaizen experience		0.714 (0.764)
<i>Tool quality</i>	-0.120 (0.821)	
Goal difficulty		0.831 (0.000)**
<i>Tool quality</i>	0.021 (0.813)	
Initiative planning time		-1.523 (0.393)
<i>Tool quality</i>	-0.011 (0.900)	
Work area routineness		0.002 (0.980)
<i>Tool quality</i>	0.014 (0.872)	
Team leader experience		2.208 (0.296)
<i>Tool appropriateness</i>	0.033 (0.628)	
Initiative planning time		-1.881 (0.337)
p-value: * < 0.05; **<0.01		

Table 20: Simultaneous regression of input factors on each significant mediator

Step 3 (z = process factor) Simultaneous regression	KC	KC	KC
	z = ACC	z = IP	z = AO
Goal clarity	0.572 (0.000)**		0.267 (0.004)**
Goal difficulty	0.107 (0.035)*		
Management support	0.258 (0.000)**	0.036 (0.642)	-0.039 (0.556)
Team autonomy	0.065 (0.347)	0.437 (0.000)**	0.504 (0.000)**
Team kaizen experience			2.784 (0.166)
p-value: * < 0.05; **<0.01			

Table 21: Significant mediation effect results

Indirect effect model	z-value	Asymmetrical distribution		Normal distribution	
		LLCI	ULCI	LLCI	ULCI
GC->ACC->KC	4.358	0.168	0.429	0.161	0.423
GD->ACC->KC	2.339	0.024	0.244	0.021	0.241
MS->ACC->KC	4.965	0.178	0.403	0.171	0.395
TA->IP->KC	3.700	0.097	0.290	0.087	0.283
GC->AO->KC	2.609	0.038	0.217	0.030	0.210
TA->AO->KC	2.676	0.054	0.321	0.049	0.315
Note: z-value: if the Z score is between -1.96 and +1.96, the p-value will be larger than 0.05, accepting the null hypothesis. Moreover, the mediation effect is significant if the 95% confidence interval between lower level confidence interval (LLCI) and upper level confidence interval (ULCI) excludes zero (Mackinnon et al., 2007).					

The rest of variables (i.e., work area routineness, team kaizen experience, team leader experience, tool quality, tool appropriateness and initiative planning process) show no significant relationship to either kaizen capabilities or attitude outcome. These findings do not prove that these variables are unimportant to the development of social outcomes. These variables may be related to social system outcomes not considered in this study.

CHAPTER V: DISCUSSION

In this chapter, the interpretation of results is provided. First, this research demonstrated that kaizen initiatives generate social outcomes that represent the improvements of the kaizen capabilities and employees' attitude. Second, the findings of the regression analysis and the mediation analysis are discussed to describe the main reasons that support every significant relationship. Finally, this chapter concludes with discussion of the limitations of the present research.

5.1. Social outcomes

The understanding of the social benefits of kaizen initiatives and their determinant factors is decisive for the successful implementation of the lean management in healthcare, as the excellence of the operational improvements cannot be achieved without employee's problem-solving capabilities and positive attitude to resolve problems (Bortolotti et al., 2015; Farris et al., 2009). Additionally, the improvements of these social outcomes are more important in healthcare, as these services rely heavily on: first, meeting the patient's needs, which fosters the healthcare professionals' desire to learn and adopt alternative ways to satisfy these patient's requirements (Mickan and Rodger, 2000); and second, an empathy with the patient and a sensitivity that rarely exist in the typical manufacturing organization. Furthermore, as the healthcare sector is characterized by being extremely hierarchical with a defined power structure and relationships among the staff and with highly skilled employees trained to act with autonomy (e.g., doctors) (Drotz and Poksinska, 2014), the lean implementation depends mainly on the fact that healthcare workers recognise and accept the personal benefits of any improvement initiatives to address their daily activities (Hasle, 2014). Therefore, the effect of kaizen initiatives on healthcare professionals (i.e., social outcomes) becomes more relevant than just demonstrating the feasibility of the application of lean tools, best practices and concepts often reported in the current lean healthcare literature.

This study demonstrated that: kaizen initiatives generate social outcomes that involve the improvement of attitude and kaizen capabilities of employees who work in teams to

improve the operational performance (i.e., technical improvements) of their work area which finally contributes to provide a better healthcare service in terms of quality, time and cost. A reason for these social benefits may lay on the fact that healthcare workers consider the kaizen initiatives as a structure where they can express their improvement ideas, feel confidence, enhance their capabilities and adopt a positive behaviour. These findings corroborate what previous scholars (e.g., Holden, 2011; Joosten et al., 2009; Ballé and Régnier, 2007) argue about the impact of kaizen initiatives on healthcare employee outcomes which were often mentioned in literature but without any empirical evidence.

To date, the success of continuous improvement initiatives is rewarded on the basis of the operational performance improvements (e.g., increase of the number of discharges, cost-reductions for the hospital, reduction of clinical errors) due to they easily represent the effort each kaizen team exerts to achieve the hospital operational outcomes (i.e., the service). However, the only focusing on these operational outcomes discourages healthcare professionals, as they recognise a lack of attention about their personal performance (Jaca et al., 2013). The findings of this study may help to address this issue, as this study demonstrates that two social outcomes (i.e., employee ‘capabilities and attitude’) are also generated in the continuous improvement initiatives, thus, future improvement initiatives may add these social outcomes to assess the success, thus, reward the kaizen team’s effort to achieve the objectives of the kaizen initiatives.

5.2. The most significant predictors of social outcomes

Moreover, the contention that input factors and process factors significantly influence both social outcomes (i.e., employees’ kaizen capabilities and attitude) have received statistical support from the regression analysis. Indeed, this study demonstrate that goal clarity, management support and team autonomy are significantly associated with both social outcomes. Besides, affective commitment to change is significantly and only related to the employees’ kaizen capabilities whereas goal difficulty is significantly and negatively related to employees’ attitude. In the following sections these relationships are exhaustively explained.

5.2.1. The most significant predictors of employees' attitude

Figure 13 illustrates the overall model of the most significant determinants of the employees' attitude that were identified in this study.

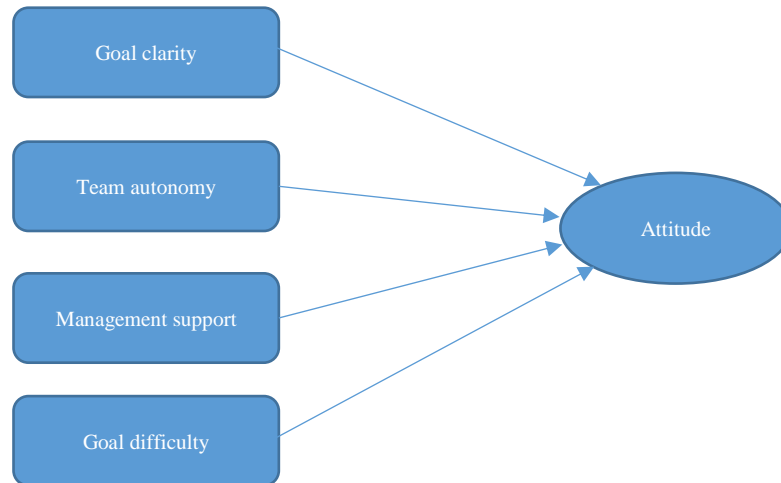


Figure 13: Model of attitude outcomes of kaizen initiatives in healthcare

The finding that goal clarity significantly influences the attitude demonstrates the decisive role of achieving an agreement about what problem is going to be resolved, particularly when an interdisciplinary team is involved. A reason for this relationship may lay on the fact that goal clarity provides a purpose (i.e., a future state) and ensure a commitment from all team members (regardless of their profession or level in the organization) (Langabeer et al., 2009; Locke, 1970). By achieving a shared-understanding of the improvement goal, healthcare workers are aware of how they will address the improvement activities to reach the above objectives, avoiding uncertain facts that could imply eventual strained and frustrated situations in future. Furthermore, the fact that the well-definition of goals is a critical factor of the employees' attitudes remarks the importance of creating a consensus within the interdisciplinary team that conducts the kaizen initiative. In healthcare, this team agreement is critical as it depends on establishing a common language among the interdisciplinary team members. For example, physicians use headlines to communicate by themselves while nurses prefer using wide stories of the patients (Makary et al., 2006; Sexton, 2004). This different communication channel may generate, among team members,

misunderstandings that later could generate frictions and resistance to change. This finding is in line with previous studies in healthcare (e.g., West and Lyubovnikova, 2013; Langabeer et al., 2009; Kim et al., 2009; Mikan, 2005), and corroborates that the detailed and formal definition of kaizen objectives induces healthcare workers to behave less reluctantly.

The finding that team autonomy is a significant predictor of attitude demonstrates the relevant role of the freedom to make change decisions and get instant feedbacks when a kaizen initiative is conducted. A justification for this relationship is that healthcare employees find a way to materialize their desire to improve their daily activities and feel empowered to perform the improvement which encourage them to participate in kaizen initiatives. Indeed, the autonomy to perform activities is crucial as it encourages healthcare professionals to be innovative and thus practice their daily activities as an art as well as a science in healthcare (Guo and Hariharan, 2012). For instance, physicians may feel comfortable when they participate in the kaizen initiatives, as they can have the same level of autonomy to make decisions during their daily professional activities, but in this case, to make decision about the improvements of the work area. Therefore, physicians will perceive that their power is extend reducing their resistance to conduct kaizen initiatives (Mosadeghrad, 2013). This finding is in line with previous studies in healthcare (e.g., Drotz and Poksinska, 2014; Bahensky et al., 2005), and confirms that the freedom to make decisions provokes healthcare workers to act more self-confidently.

The finding that management support is significantly associated with the employees' attitude demonstrates the relevance of allocating the sufficient resources to conduct a kaizen initiative. In healthcare, sufficient resources are crucial to teams exercise their essential team skill and thus perform its task in the best manner (Kvarnström, 2008), as this predisposition of the organization may activate the sense of responsibility of employees for improving their work areas. Therefore, healthcare workers may feel more confident and engaged with the improvement practices when it is guaranteed the management support towards the kaizen initiatives (Radnor, 2011). This result support previous studies that aunderline the role of the management support to engage positive employees' attitude (Al-Balushi et al., 2014; Andersen et al., 2014).

The findings that goal difficulty is significantly and negatively related to employee's attitude demonstrates that relevance of achieving healthcare workers' satisfaction when a kaizen initiatives is planned in healthcare. This finding supports the Bradley and Willett 's (2004) experiment inferences that suggest that kaizen team members that work with no-complex goals will be more satisfied with their progress due to the immediate implementation of the solutions using well-know, simple, lean tools. In healthcare, although West and Lyubovnikova (2013) suggested that the goals should be sufficient complex to motivate a teamwork, this study extends this contribution by suggesting that these goals must be appropriately set in order to avoid frustrations and guarantee a positive employee's attitude which can ensure the continuous performance of kaizen initiatives.

5.2.2. Significant predictors of employees' kaizen capabilities

In figure 14, the final model of the most significant determinants of the employees' kaizen capabilities that were identified in this study are illustrated.

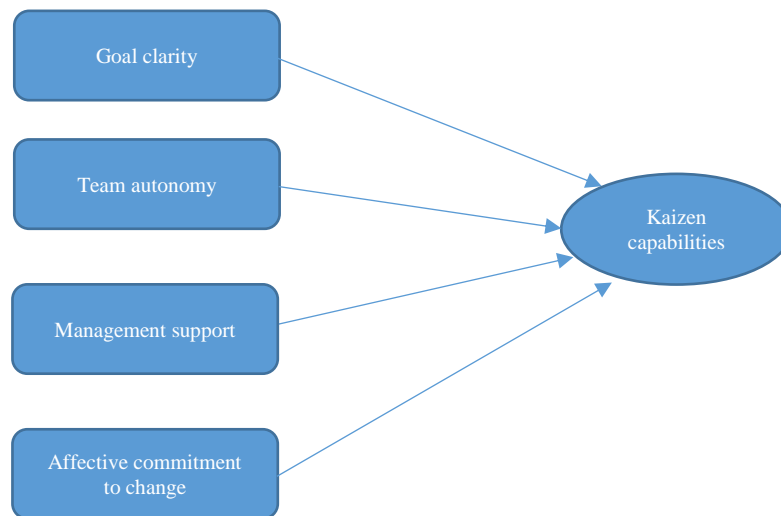


Figure 14: Model of kaizen capabilities outcomes of kaizen initiatives in healthcare

The finding that goal clarity is a significant predictor of employees' kaizen capabilities indicates that healthcare employees that comprehend the objectives thoroughly through a team consensus will develop their problem-solving capabilities. A reason for this

relationship lies on the fact that when healthcare professionals recognise potential initiatives to improve the healthcare service by setting a clear objective, their personal desire to improve their array of problem-solving capabilities is activated to achieve this objective (Mickan and Rodger, 2000). This finding is in line with previous healthcare studies (e.g., West and Lyubovnikova, 2013; Kim et al., 2009; Mickan, 2005), and corroborates that the specification of the objectives stimulates healthcare workers to enlarge their communication and management capabilities. Additionally, this finding supports the importance of goal clarity and contradicts studies that suggest using loosely goals as the well-defined goals helps team members to effectively attack and eliminate the work area problems using a kaizen initiative (Bradley and Willett, 2004).

The finding that team autonomy is a significant predictor of employees' kaizen capabilities supports the notion that the autonomy to immediately execute change trials improve the employees' kaizen capabilities. A reason for this relationship may be that employees who perceive and realise the offered autonomy activate their learning cycle capability which stimulate them to improve their array of problem-solving capabilities to meet the patients' needs (Mickan and Rodger, 2000). Thanks to team autonomy, healthcare professionals may use their creativity and their whole knowledge without any concerns to improve their work area, that is, how improve their work area. In another example, autonomy allows healthcare workers to decide when conduct an improvement initiative without any rigid schedule that may clash with the emergencies or unexpected patient's request. This finding is aligned with previous studies (e.g., Bahensky et al., 2005), and supports that the level of autonomy to make change decisions fosters healthcare workers to develop their capabilities (e.g., communication capabilities)

The finding that management support significantly influence the employees' kaizen capabilities demonstrates the relevance of the structural provisions to develop the kaizen mentality. Indeed, the implementation of the lean management in healthcare requires a change in the culture that leads to everyone to adopt improvement behaviours of all staff (Al-Balushi et al., 2014; Dahlgaard et al., 2011; Hines et al., 2004). However, the employees' willingness to adopt these kaizen behaviours depend on the support that senior leadership provided to the team, including materials and supplies, equipment, and

assistance from organizational members – the facilitator, senior management, and others (Van Aken et al., 2010). This finding is aligned with previous studies that foster the relevance of management support to improve the employees' kaizen capabilities, as employee's can use their skills and creativity without any concern (Al-Balushi et al., 2014; Andersen et al., 2014).

The finding that affective commitment to change is a significant predictor of employees' kaizen capabilities demonstrates that the strong belief of the benefits of kaizen initiatives encourages team members to master their personal skills or capabilities (e.g., problem-solving capabilities). In healthcare, achieving the employees' commitment is crucial as it reflects the level of employees' acceptance of the presence of operational problems within their work areas and the willingness to solve them (Fabiene and Kachchhap, 2016; Manetje and Martins, 2009). Therefore, the development of the affective commitment to change (i.e., the strong individual's desire to change) (Herscovitch and Meyer, 2002) may be a key strategy for the implementation of kaizen initiatives in healthcare, as it may ensure healthcare professionals to understand that the kaizen initiative is not a waste of time but a way to obtain more time to recovery patients (Hasle, 2014). This finding is aligned with previous studies (e.g., Andersen et al., 2014; Poksinska, 2010), confirming that the acceptance of the benefits of kaizen initiatives incites healthcare workers to enhance their employee capabilities. This finding confirms what other studies suggested about the importance of employee commitment and the necessity to capture effectively the employee's interest to make better change decisions and thus perform effectively the continuous improvement initiatives (e.g. Farris et al., 2009; Bateman, 2005; Bradley and Willett, 2004; Keating et al., 1999).

5.3. Mediation effect

Furthermore, it was found that affective commitment to change, internal processes, action orientation partially mediate the effect of input factors on each social outcomes of kaizen initiatives. The mediation effect of these process factors is illustrated in figure 15.

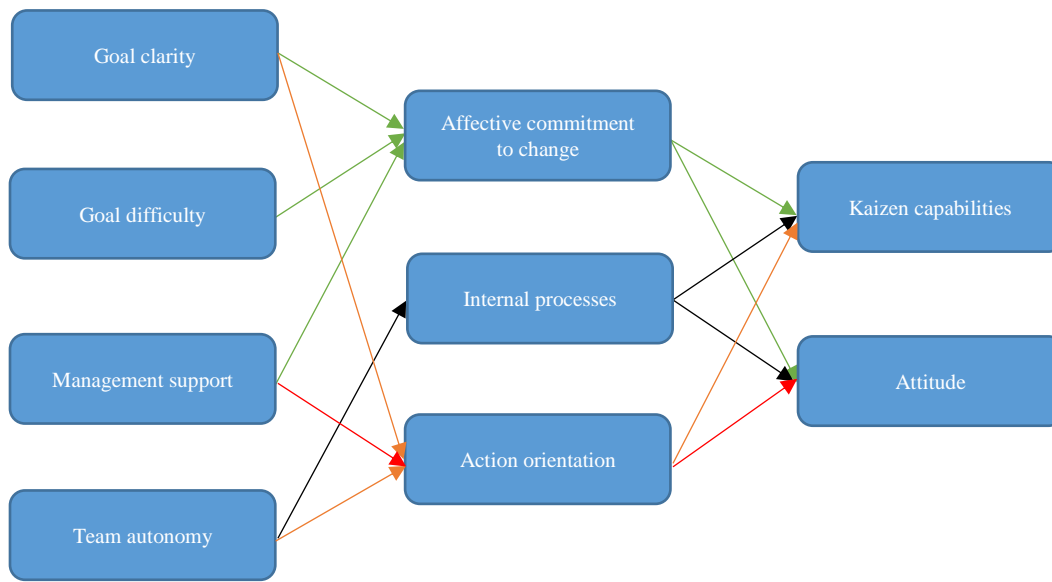


Figure 15: Mediation effect of process variables (i.e., affective commitment to change, internal processes and action orientation) of kaizen initiatives in healthcare

The fact that input factors as goal clarity, goal difficulty, team autonomy and management support affect both social outcomes through the affective commitment to change, internal processes and action orientation shed light on the mechanism whereby healthcare workers develop their kaizen mentality. Indeed, the findings demonstrate that the significant input factors design factors (i.e., goal clarity, goal difficulty and team autonomy) and organizational support (i.e., management support) (Farris et al., 2009) activate the subsequent interactions and functions of employees during the teamwork process (Jaca et al., 2013), the immediate recognition of benefits of improvement initiatives and the performance of hand-on activities, in the right sequence, which finally develop a positive employees' attitude and kaizen capabilities. An explanation for these indirect effects is that healthcare workers develop a previous knowledge and confidence about what to do and how to do it based on agreements with their colleagues, the level of autonomy to make decisions and the availability of resources to carry out the kaizen initiative which later endorses the willingness and good performance of team improvement activities and the development of the beliefs in the benefits of kaizen initiatives that stimulates later to develop both an eager behaviour and the enhancement of employees' kaizen capabilities.

Additionally, these findings suggest a connection between the planning process and execution process of kaizen initiatives (Van Aken et al., 2010) because the input factors are considered in the planning of the team activities, and they influence the characteristics of the subsequent team dynamics and processes (Jaca et al., 2013). In healthcare, although professionals are trained and have sufficient experience to work in teams to recovery patients (Tanco et al., 2011), however, these input factors are often neglected when an improvement initiative is undertaken, developing a poor implementation planning which finally fails due to the ambiguous understanding of what needs to happen, unrealistic deadlines and non-sufficient resources which consequently involve negative social outcomes (Longenecker and Longenecker, 2014). Therefore, it is imperative that right conditions for kaizen initiatives and clear suitable objectives should be set in healthcare, as these activate the significant mediator dimensions that will ensure later successful social outcomes. A reason for this inference lay on the fact that the success of lean projects, as kaizen initiative, in health care are rather more about adaption than adoption (Ljungblom, 2014; Radnor et al., 2012; Dahlgaard et al., 2011; Poksinska, 2010; Radnor and Walley, 2008). Therefore, there is no a unique successful way to implement the lean management (Ljungblom, 2014; Radnor et al., 2012; Poksinska, 2010; Joosten et al., 2009). However, the planning details, in terms of right conditions for lean initiatives (i.e., kaizen initiatives) and clear suitable objectives, are needed to be defined to run the following serious of task aimed to achieve the operational performance improvements and, as it is demonstrated in this study, the social outcomes (i.e., employee's kaizen capabilities and attitude) through the team dynamics, hand on activities and team members' buy-in.

5.4. Relevance of social benefits of kaizen initiatives

5.4.1. Theoretical contribution

This research contributes to the body of knowledge of kaizen initiatives in healthcare through the quantitative identification of the social outcomes of these initiatives and their direct and indirect predictors based on the theoretical model of Farris et al. (2009). To date, much of prior research (e.g., Al-Balushi et al., 2014; West and Lyubovnikova, 2013; Herscovitch and Meyer, 2002) provides a fragmented picture of some predictors of social

outcomes and their relations, thus, decreasing the generalizability of their findings. This study overcome this limitation since it tests the model Farris et al. (2009) which encloses a set of input and process factors that may be related to the social outcomes of kaizen initiatives. By testing this model, we found that social outcomes of kaizen initiatives in healthcare are the improvement of attitude and kaizen capabilities of employees. These findings are consistent with what previous scholars (e.g., Holden, 2011; Joosten et al., 2009; Ballé and Régnier, 2007) argue about the impact of kaizen initiatives on healthcare employee outcomes which were often mentioned but without any empirical evidence (e.g., Poksinska et al., 2016; Holden, 2011) and past healthcare studies that criticize the excessively focus on the implementation of lean tools rather than on the lean philosophy (Burgess and Radnor, 2013).

Furthermore, this study contributes to the debate about the causal relationships between the set of determinants (inputs and process factors) and the social outcomes and their mechanisms that are underlined in team effectiveness literature (West and Lyubovnikova, 2013), team work literature (Lemieux-Charles and McGuire, 2006) and lean literature (Mazzocato et al., 2010) in the healthcare context. Based on these findings, this research leads to important recommendations about the key variables, from the design stage to the practicing stage, that ensure successful social outcomes of continuous improvement initiatives in healthcare. In this way, our research can help lean healthcare practitioners overcome issues related to the unwillingness of healthcare workers to carry out improvement initiatives and complements the general assumption to achieve just technical outcomes using continuous improvement initiatives (Joosten et al., 2009).

5.4.2. Managerial contribution

In terms of managerial implications, the demonstration of the feasibility of social outcomes and the identification of their determinant factors serve as a foundation on which lean practitioners (e.g. managers, coordinators and facilitators) can set up ad hoc strategies that will ensure healthcare workers to understand the kaizen approach correctly with subsequent effects on operational improvements, instead of replicating successful strategies from the manufacturing sector (Radnor et al., 2012) or implementing the lean tools without

understanding why one of them are implemented (Burgess and Radnor, 2013). The incorrect understanding of the lean management and its benefits may be the key reason why healthcare workers consider kaizen initiatives as a flavour of month or another trial to resolve the problems of the healthcare sector (Radnor et al., 2012).

This study re-emphasises the importance of social outcomes of continuous improvement initiatives, as these outcomes are associated with how the healthcare workers perceive the continuous improvement approach. Managers can strive to develop strategies aimed to achieve these social outcomes by emphasizing the clear and shared understanding of goal, guaranteeing the autonomy to make changes, create a multidisciplinary team and ensure the sufficient resources before starting the continuous improvement initiatives and constructing the team members' belief of benefits of continuous improvement initiatives. In this way, an organizational culture based on the continuous improvement (Lee et al., 2013) may be developed, from the planning stage to the executing stage, decreasing the risk of cultural resistance to change of employees in the healthcare context. Therefore, lean healthcare practitioners (e.g. managers, coordinators and facilitators) should understand the importance of having strong integration of these factors with the subsequent effect on the technical outcomes. Furthermore, lean practitioners can use our findings to improve their current kaizen initiative strategies, as they can decide whether enhance the attitude or the employee capabilities, or either in areas that call for support.

5.5.Limitations and future research

Moreover, it is important to describe the potential limitations and how these can be turned into opportunities for future research.

- First, this research considers only English peer-reviewed papers to conduct the literature review and mostly English theoretical and anecdotal studies to support the constructs of the model of Farris et al. (2009). The examination of non-English studies could shed light on relevant insights of lean healthcare literature and different kaizen social outcomes and their input and process factors to create and test new theories.

- Second, this study does not attempt to identify all social outcomes and their input and process factors of kaizen initiatives. The findings of this study only hold for the model of Farris et al. (2009) which were adapted to the healthcare context. This study does not exclude significant effects from unstudied variables in the healthcare context. Therefore, research on different social outcomes and their relationships with different input and process factors could be the subject of future research.
- Third, the cross-sectional nature of our data which impedes to trace the improvement of kaizen social outcomes from one initiative to another. A longitudinal study could provide more insight on when, how and why kaizen teams yield better social outcomes.
- Fourth, this study has considered the continuous improvement initiatives of two Italian public hospitals. Future research may test the validity of the theoretical framework across a variety of context, such as including also private hospitals, hospitals in other countries to give a wider perspective on which determinants are crucial to yield kaizen social outcomes or healthcare organizations with longer experience (more than 5 years) in using continuous improvement initiatives to generalize the findings of this research.
- Finally, this study focuses only on the assessment of social outcomes, future research could assess the relationship between the improvements of social outcomes and operational outcomes in the healthcare context in order to identify which determinant factors influence both technical and social outcomes of continuous improvement initiatives.

CHAPTER VI: CONCLUSIONS

This study showed that lean management is successfully implemented in many healthcare organizations generating both technical and social outcomes confirming the assertion of Joosten et al. (2009). Based on the findings of this study, it is possible to answer the research questions that were formulated in the chapter 1.

At first, the healthcare organizations implement the lean management to tackle the efficiency and quality problems because the lean paradigm allows to continuously increase value for the customer while reducing wastes without high investments (De Souza, 2009; Ballé and Régnier, 2007). Indeed, many operational performance improvements (e.g., cost reduction, quality improvement) are achieved due to the lean implementation which is usually adopted through different lean initiatives that are performed following a structured approach (e.g., kaizen projects, A3 reports, kaizen events) or just by implementing common lean practices or concepts without any structured approach (Van Aken et al., 2010).

Particularly, in this study, the structured lean initiatives, called as kaizen initiatives, were studied. A kaizen initiative can be defined as a structured project performed by a multi-disciplinary team with the aim of improving a targeted work area or process within a timeframe. This mechanism allows improving the operational aspects of a work area (Holden, 2011) through the reduction of process wastes as consequence of employees adopt and develop problem-solving capabilities (Poksinska et al., 2016; Dickson et al., 2009) and a positive attitude that encourage them to continuously undertake improvement activities (Tortorella et al., 2015; Sobek II and Smalley, 2008; Lee and Bruvold, 2003). Among the type of kaizen initiatives that are adopted to implement the lean management approach, the kaizen events and A3 reports are mainly used in healthcare to generate technical and social outcomes.

Based on the literature review findings, it can be argued that most of the healthcare organizations that adopt the kaizen mechanism focus mainly on achieving technical outcomes whereas a small share of the studies reported social outcomes. Among these few

studies, it was found that recently many empirical studies are addressing the social field of kaizen initiatives. Specifically, these studies report social outcomes related to the improvement of attitude and of problem solving capabilities. These literature findings were corroborated by this study, as it was demonstrated that kaizen initiatives performed at the two Italian healthcare organizations improved both employee's capabilities and attitude in healthcare, corroborating previous studies (e.g., Holden, 2011; Poksinska, 2010; Joosten et al., 2009). Furthermore, these results support the idea that social outcomes (employees' kaizen capabilities and attitude) are the corner stone to ensure the development of the continuous improvement mentality, as these social outcomes represent the employee capabilities and attitude that are crucial to the lean management implementation in healthcare (Ballé and Régnier, 2007).

In what respect the most determinant predictors of these social outcomes, it was demonstrated that these social outcomes (i.e., attitude and kaizen capabilities) are impacted by predictors related to the kaizen design procedures (goal clarity, goal difficulty), team autonomy, physiological characteristics (i.e., affective commitment to change) and organizational support (i.e., management support). Table 22 shows the positive relationships between predictors and social outcomes which are denoted by a “+” while a “-” denotes the negative relationships. These findings were obtained following a systematic analysis of the theoretical model of Farris et al. (2009) using a sample of 105 continuous improvement initiatives from an initial stage of the lean management implementation of two public healthcare organization in Italy

Table 22: Summary of most influential factors of social outcomes of kaizen initiatives

	Attitude	Kaizen capabilities
Goal clarity	+	+
Goal difficulty	-	
Team autonomy	+	+
Team kaizen experience		
Team leader experience		
Team functional heterogeneity		
Management support	+	+
Initiative planning support		
Work area routineness		
Action orientation		
Affective commitment to change		+
Internal processes		

Tool quality		
Tool appropriateness		

Additionally, this study also elucidates the mechanism whereby these variables influence directly and indirectly the employees' capabilities and attitude outcomes of kaizen initiatives by analysing the mediation effect of process variables (i.e., mediators). In table 23, a "+" indicates the positive relationships between predictors and mediators; and between mediators and social outcomes while a "-" denotes the negative relationships.

Table 23: Summary of results of the mediation effect of process factors (i.e., mediators) between input variables and social outcomes

		Mediators					Social outcomes	
		Affective commitment to change	Internal processes	Action orientation	Tool quality	Tool appropriateness	Attitude	Kaizen capabilities
Inputs	Goal clarity	+		+				
	Goal difficulty	+						
	Team autonomy		+	+				
	Team kaizen experience							
	Team leader experience							
	Team functional heterogeneity							
	Management support	+		+				
	Initiative planning support							
	Work area routineness							
Mediators	Action orientation						+	+
	Affective commitment to change						+	+
	Internal processes						+	+
	Tool quality							
	Tool appropriateness							

The above findings contribute to the body of knowledge of kaizen initiatives in healthcare as they demonstrate that input determinants mainly of the planning stage activate the subsequent teamwork process determinants (Jaca et al., 2013) of the execution stage which finally develop a positive attitude and kaizen capabilities of healthcare workers. Therefore, it is imperative that right conditions for kaizen initiatives should be created in healthcare, as these activate the significant mediator dimensions that will ensure later successful social outcomes and thus successful operational outcomes.

Consequently, the answer to the general question (i.e., “what are the social outcomes of lean initiatives in healthcare”) is: “*the social outcomes of lean initiatives are the improvement of the problem-solving capabilities of healthcare professionals and their attitude.*” (Poksinska et al., 2016; Dickson et al., 2009)

In closing, this study reemphasizes the call from Lemieux-Charles and McGuire (2006), regarding the lack of research on team effectiveness outcomes in healthcare and the call to develop a strategy built on employee pull feedback (Keating et al., 1999), constant behaviour assessment and trust stakeholder commitment from McIntosh et al. (2013). Thus, it is a task of operation management community to help healthcare organizations to fill this team management gap and contribute to the development of an effective strategy to improve continuously the healthcare service.

LIST OF PUBLICATIONS

International peer reviewed journal publications

- P. Danese, P. Romano, T. Bortolotti, S. Boscari, H.A. Medina Suni, N. Rich, “Lean in healthcare: the social benefits of kaizen initiatives”, submitted to International Journal of Operations and Production Management (in review), 2017.

Full papers in proceedings of international conferences

- H.A. Medina Suni, C. Bianciardi, J. Guercini, P. Romano, “**Critical factors to successfully develop A3 reports in healthcare sector.**” Proceedings of the 5th Production Engineering and Management”, Trieste, Italy, 1-2 October 2015.
- H. A. Medina Suni, P. Romano, P. Danese, J. Guercini, C.Bianciardi, “**An investigation on kaizen events in a health care organization: critical success factors for social outcomes**”. Proceedings of the 16th European Academy of Management conference, Paris, France, 1-4 June 2016.

Chapters of books

- Hebert Alonso Medina Suni, Caterina Bianciardi, (2016), “**Non solo efficienza: l'impatto sociale del Lean**”. Franco Angeli, FA, Lean Healthcare: il caso dell' AOU Senese. Storia di una strategia vincente, Milano.

REFERENCES

- Ahire, S.L., Golhar, D.Y. and Waller, M.A., "Development and validation of TQM implementation constructs", *Decision Sciences*, Vol. 27 No. 1, 1996, pp. 23-56.
- Aij, K.H., Simons, F.E., Widdershoven, G.A. and Visse, M., "Experiences of leaders in the implementation of Lean in a teaching hospital—barriers and facilitators in clinical practices: a qualitative study", *BMJ open*, Vol. 3 No. 10, 2013, p. e003605.
- Al-Araidah, O., Momani, A., Khasawneh, M. and Momani, M., "Lead-time reduction utilizing lean tools applied to healthcare: the inpatient pharmacy at a local hospital", *Journal for Healthcare Quality: Official Publication of the National Association for Healthcare Quality*, Vol. 32 No. 1, 2010, pp. 59-66.
- Al-Balushi, S., Sohal, A.S., Singh, P.J., Al Hajri, A., Al Farsi, Y.M., and Al Abri, R., "Readiness factors for lean implementation in healthcare settings—a literature review", *Journal of health organization and management*, Vol. 28 No. 2, 2014, pp. 135-53.
- Alreck, P.L. and Settle, R.B., *The Survey Research Handbook*, Irwin, Homewood, IL, 1985.
- Amaratunga, D. and Baldry, D., "Case study methodology as a means of theory building: performance measurement in facilities management organisations", *Work Study*, Vol. 50 No. 3, 2001, pp. 95-104.
- Andersen, H., Røvik, K.A. and Ingebrigtsen, T., "Lean thinking in hospitals: is there a cure for the absence of evidence? A systematic review of reviews", *BMJ open*, Vol. 4 No. 1, 2014, p.e003873.
- Anderson, J.C. and Gerbing, D.W., "Structural equation modelling in practice: a review and recommended two-step approach", *Psychological Bulletin*, Vol. 103 No. 3, 1988, pp. 411-23.
- Anderson, P.A., "Decision making by objection and the Cuban Missile Crisis", *Administrative Science Quarterly*, Vol. 28, 1983, pp. 201-22.
- Atkinson, P. and Mukaetova-Ladinska, E.B., "Nurse-led liaison mental health service for older adults: service development using lean thinking methodology", *Journal of Psychosomatic Research*, Vol. 72 No. 1, 2012, pp. 328-331.
- Bahensky, J.A., Roe, J. and Bolton, R., "Lean sigma—will it work for healthcare", *Journal of Healthcare Information Management*, Vol. 19 No. 1, 2005, pp. 39-44.

- Bagozzi, R.P., Yi, Y. and Phillips, L.W., "Assessing construct validity in organizational research", *Administrative Science Quarterly*, Vol. 36 No. 4, 1991, pp. 421-34.
- Bagozzi, R.P., and Foxall, G. R., "Construct validation of a measure of adaptive-innovative cognitive styles in consumption", *International Journal of Research in Marketing*, Vol. 13 No. 3, 1996, pp. 201-213.
- Ballé, M. and Régnier, A., "Lean as a learning system in a hospital ward", *Leadership in Health Services*, Vol. 20 No. 1, 2007, pp. 33-41.
- Baron, M.A. and Kenny, D.A., "The moderator-mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations", *Journal of Personality and Social Psychology*, Vol. 51 No. 6, 1986, pp. 1173-82.
- Bartko, J.J., "On various intraclass correlation reliability coefficients", *Psychological Bulletin*, Vol. 83 No. 5, 1976, pp. 762-765.
- Barratt, M., Choi, T.Y. and Li, M., "Qualitative case studies in operations management: trends, research outcomes, and future research implications", *Journal of Operations Management*, Vol. 29 No. 4, 2011, pp. 329-342.
- Bassuk, J. and Washington, I., "The A3 problem solving report: a 10-step scientific method to execute performance improvements in an academic research vivarium", *PloS ONE*, Vol. 8 No. 10, 2013.
- Bateman, N., "Sustainability: the elusive element of process improvement", *International journal of operations & production management*, Vol. 25 No. 3, 2005, pp. 261-276.
- Becker, H.S., *Writing for social scientists: how to start and finish your thesis*, University Press of Chicago, Chicago, IL, 1986.
- Bennett, C., Khangura, S., Brehaut, J. C., Graham, I. D., Moher, D., Potter, B. K., and Grimshaw, J. M., "Reporting guidelines for survey research: an analysis of published guidance and reporting practices", *PLoS Med*, Vol. 8 No. 8, 2011, e1001069.
- Benbasat, I., Goldstein, D. K., and Mead, M., "The case research strategy in studies of information systems", *MIS quarterly*, 1987, pp. 369-386.
- Berger, M.A., "In defence of the case method: a reply to Algyris", *Academy of Management Review*, Vol. 8 No. 2, 1983, pp. 329-86.
- Bliese, P.D., "Within-group agreement, non-independence, and reliability: implications for data aggregation and analysis", in Klein, K.J. and Kozlowski, S.W.J. (Eds), *Multilevel Theory, Research, and Methods in Organizations*, Jossey-Bass, San Francisco, CA, 2000, pp. 349-81.

Bollen, K.A., Long, J.S., *Testing Structural Equation Models*, Sage publications, Newbury Park, CA, 1993.

Bortolotti, T., Boscari, S., and Danese, P., “Successful lean implementation: Organizational culture and soft lean practices”, *International Journal of Production Economics*, Vol. 160, 2015, pp. 182-201.

Bradley, J. and Willett, J., “Cornell students participate in Lord Corporation's Kaizen projects”, *Interfaces*, Vol. 34 No. 6, 2004, pp. 451-9.

Bryne, B.M., *A Primer of LISREL: Basic Applications and Programming for Confirmatory Factor Analytic Model*. Springer-Verlag, New York, 1989.

Burgess, N., and Radnor, Z., “Evaluating Lean in healthcare”, *International journal of health care quality assurance*, Vol. 26 No. 3, 2013, pp 220-235.

Campbell, D.T. and Fiske, D.W., “Convergent and discriminant validation by the multitrait-multimethod matrix”, *Psychological Bulletin*, Vol. 56 No. 9, 1959, pp. 81-105.

Casey, D., “Using action research to change health-promoting practice”, *Nursing & health sciences*, Vol. 9 No. 1, 2007, pp. 5-13.

Carmines, E.G. and Zeller, R.A., *Reliability and Validity Assessment*, Sage, New York., NY, 1990.

Carter, P.M., Desmond, J., Akanbobnaab, C., Oteng, R., Rominski, S. and Barsan, W., “Optimizing clinical operations as part of a global emergency medicine initiative in Kumasi, Ghana: application of lean manufacturing principals to low-resource health systems”, *Academic Emergency Medicine*, Vol. 19 No. 3, 2012, pp. 338-349.

Chau, P.Y.K., “Reexamining a model for evaluating information center success using a structural equation modeling approach”, *Decision Sciences*, Vol. 28, 1997, pp. 309–334.

Churchill, G.A., “A paradigm for developing better measures of marketing constructs”, *Journal of Marketing Studies*, Vol. 16, 1979, pp. 12–27.

Clark, D.M., Silvester, K., and Knowles, S., “Lean management systems: creating a culture of continuous quality improvement”, *Journal of clinical pathology*, Vol. 66 No 8, 2013, pp. 638-643

Coghlan, D., and Brannick, T., *Doing action research in your own organization*, Sage, 2014.

Cohen, S.G. and Bailey, D.E., “What makes teams work: group effectiveness research from the shop floor to the executive suite”, *Journal of Management*, Vol. 23 No. 3, 1997, pp. 239-90.

Coughlan, P. and Coughlan, D., "Action research for operations management", *International Journal of Operations & Production Management*, Vol. 22 No. 2, 2002, pp. 220-40.

Cronbach, L.J., "Coefficient alpha and the internal structure of tests", *Psychometrika*, Vol. 16 No. 3, 1951, pp. 297-334.

Creswell, J., *Research Design, Qualitative and Quantitative Approaches*, Sage Publications, London, 2003.

D'Andreanmatteo, A., Ianni, L., Lega, F., and Sargiacomo, M., "Lean in healthcare: A comprehensive review", *Health Policy*, Vol. 119 No. 9, 2015, pp. 1197-1209

Dahlgaard, J.J. and Dahlgaard-Park, S.M., "Lean production, six sigma quality, TQM and company culture", *The TQM Magazine*, Vol. 18 No. 3, 2006, pp. 263-281.

Dahlgaard, J., Pettersen, J. and Dahlgaard-Park, S., "Quality and lean healthcare: a system for assessing and improving the health of healthcare organizations", *Total Quality Management*, Vol. 22 No. 6, 2011, pp. 673-689.

De Souza, L.B., "Trends and approaches in lean healthcare", *Leadership in Health Services*, Vol. 22 No. 2, 2009, pp. 121-39.

De Souza, L.B. and Pidd, M., "Exploring the barriers to lean health care implementation", *Public Money & Management*, Vol. 31 No. 1, 2011, pp. 59-66.

Devine, D.J., "A review and integration of classification systems relevant to teams in organizations", *Group Dynamics: Theory, Research, and Practice*, Vol. 6 No. 4, 2002, pp. 291-310

Dickson, E.W., Singh, S., Cheung, D.S., Wyatt, C.C. and Nugent, A.S., "Application of lean manufacturing techniques in the emergency department", *The Journal of emergency medicine*, Vol. 37 No. 2, 2009, pp. 177-82.

Dillman, D.A., *Mail and Internet Surveys: The Tailored Design Method*, 2nd ed., Wiley, New York, NY, 2000.

Douglas, T.J. and Judge, W.Q., "Total quality management implementation and competitive advantage: the role of structural control and exploration", *Academy of Management Journal*, Vol. 44 No. 1, 2001, pp. 158-69.

Drotz, E. and Poksinska, B., "Lean in healthcare from employees' perspectives", *Journal of Health Organization and Management*, Vol. 28 No. 2, 2014, pp. 177-95.

Easton, G.S., and Rosenzweig, E.D., "The role of experience in six sigma project success: An empirical analysis of improvement projects", *Journal of Operations Management*, Vol. 30 No. 7, 2012, pp. 481-493.

Eisenhardt, K.M., "Building theories from case study research", *Academy of Management Review*, Vol. 14 No. 4, 1989, pp. 532-50.

Eitel, D.R., Rudkin, S.E, Malvey, M.A., Killeen, J.P. and Pines, J.M., "Improving service quality by understanding emergency department flow", *The Journal of Emergency Medicine*, Vol. 38 No. 1, 2010, pp. 70-79

Elden, M., and Chisholm, R. F., "Emerging varieties of action research: Introduction to the special issue", *Human relations*, Vol. 46 No. 2, 1993, pp. 121-142.

Elovainio, M. and Kivimäki, M., "Occupational stresses, goal clarity, control, and strain among nurses in the finnish healthcare system", *Research in Nursing and Health*, Vol. 19 No. 6, 1996, pp. 517-24.

Fabiene, E.E., and Kachchhap, S.L., "Determinants of Employee's Commitment among Healthcare Professionals", *International Journal of Academic Research in Accounting, Finance and Management Sciences*, Vol. 6 No 2, 2016, pp. 44-52.

Farris, J., Van Aken, E., Doolen, T. and Worley, J., "Critical success factors for human resource outcomes in Kaizen events: An empirical study", *International Journal of production Economics*, Vol. 117 No. 1, 2009, pp. 42-65.

Ferrance, E., Action Research. Northeast and Islands Regional Educational, Laboratory at Brown University, 2000.

Filippini, R., "Operations management research: some reflections on evolution, models and empirical studies in OM", *International Journal of Operations & Production Management*, Vol. 17 No. 7, 1997, pp. 655-70.

Fillingham, D., "Can lean save lives?", *Leadership in Health Services*, Vol. 20 No. 4, 2007, pp. 231-41.

Fine, B.A., Golden, B., Hannam, R. and Morra, D., "Leading lean: a Canadian healthcare leader's guide", *Healthcare Quarterly*, Vol. 12 No. 3, 2009, pp. 32-41.

Flynn, B.B., Sakakibara, S., Schroeder, R.G., Bates, K.A. and Flynn, E.J., "Empirical research methods in operations management", *Journal of Operations Management*, Vol. 9 No. 2, 1990, pp. 250-84.

Forza, C., "Survey research in operations management: a process-based perspective", *International journal of operations & production management*, Vol. 22 No. 2, 2002, pp. 152-194.

Galletta, M., Portoghese, I., and Battistelli, A., “Intrinsic motivation, job autonomy and turnover intention in the Italian healthcare: The mediating role of affective commitment”, *Journal of Management Research*, Vol. 3 No. 2, 2011, pp. 1.

Galliers, R.D, “In Search of a Paradigm for Information Systems Research.” In *Research Methods for Information Systems*, E. Mumford and R. Hirschheim (eds.) Amsterdam: North-Holland, 1985.

Glasow, P.A., *Fundamentals of survey research methodology*, 2005

Gersick, C.J.G., “Time and transition in work teams: towards a new model of group development”, *Academy of Management Review*, Vol. 31, 1988, pp. 9-41.

Glover, W.J., Farris, J.A., and Van Aken, E.M., “Kaizen events: Assessing the existing literature and convergence of practices”, *Engineering Management Journal*, Vol. 26 No. 1, 2014, pp. 39-61.

Ghosh, M., and Sobek II, D.K., “A problem-solving routine for improving hospital operations”, *Journal of health organization and management*, Vol. 29 No. 2, 2015, pp. 252-70.

Gomm, R., and Davies, C., *Using evidence in health and social care*. Sage, 2000.

Gray, J., “A Lean towards service improvement”, *Journal of Integrated Pathways*, Vol. 11 No. 1, 2007, pp. 1-10.

Guo, L. , and Hariharan, S., “Patients are not cars and staff are not robots: Impact of differences between manufacturing and clinical operations on process improvement”, *Knowledge and Process Management*, Vol. 19 No. 2, 2012, pp. 53–68.

Gupta, S., Verma, R., and Victorino, L., “Empirical research published in production and operations management (1992–2005): trends and future research directions”, *Production and operations management*, Vol. 15 No. 3, 2006, pp. 432-448.

Guyette, S., *Community-based research: A handbook for Native Americans*. Amer Indian Studies Center, 1993.

Guzzo, R.A. and Shea, G., “Group performance and intergroup relations in organizations”, in Dunnette, M.D. and Hough, L.M. (Eds), *Handbook of Industrial and Organizational Psychology*, Consulting Psychologists Press, Palo Alto, CA, 1992, pp. 269-313.

Hasle, P., “Lean production—an evaluation of the possibilities for an employee supportive lean practice”, *Human Factors and Ergonomics in Manufacturing & Service Industries*, Vol. 24 No. 1, 2014, pp. 40-53.

Hair, J.F. Jr, Anderson, R.E., Tatham, R.L. and Black, W.C., *Multivariate Data Analysis*, Prentice-Hall, Englewood Cliffs, NJ., 1998.

Herscovitch, L. and Meyer, J.P., "Commitment to organizational change: extension of a three-component model", *Journal of applied psychology*, Vol. 87 No. 3, 2002, pp. 474-87

Hines, P. , Holweg, M. and Rich, N., "Learning to involve. A review of contemporary lean thinking", *International Journal of Operations and Production Management*, Vol. 24 No. 10, 2004, pp. 994-1011.

Holden, R.J., "Lean thinking in emergency departments: a critical review", *Annals of emergency medicine*, Vol. 57 No. 3, 2011, pp. 265-78.

Hong, P., Ga (Mark) Yang, M., and D. Dobrzykowski, D., "Strategic customer service orientation, lean manufacturing practices and performance outcomes: An empirical study", *Journal of Service Management*, Vol. 25 No. 5, 2014, pp. 699-723

Hu, L.T., and Bentler, P.M., "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives", *Structural equation modeling: a multidisciplinary journal*, Vol. 6 No. 1, 1999, pp. 1-55.

Hulland, J., "Use of partial least squares (PLS) in strategic management research: a review of four recent studies", *Strategic Management Journal*, Vol. 20, 1999, pp. 195-204.

Hung, D., Martinez, M., Yakir, M., and Gray, C., "Implementing a Lean Management System in primary care: Facilitators and barriers from the front lines", *Quality Management in Healthcare*, Vol. 24 No. 3, 2015, pp. 103-108.

Huxham, C., and Vangen, S., "Researching organizational practice through action research: Case studies and design choices", *Organizational Research Methods*, Vol. 6 No. 3, 2003, pp. 383-403.

Jaca, C. , Viles, E. , Tanco, M. , Mateo, R. and Santos, J., "Teamwork effectiveness factors in healthcare and manufacturing industries", *Team Performance Management*, Vol. 19 Nos 3/4, 2013, pp. 222-236.

James, L.R., Demaree, R.G. and Wolf, G., "Estimating within-group interrater reliability with and without response bias", *Journal of Applied Psychology*, Vol. 69, 1984, pp. 85–98.

Janz, B.D., Colquitt, J.A., and Noe, R.A., "Knowledge worker team effectiveness: The role of autonomy, interdependence, team development, and contextual support variables", *Personnel psychology*, Vol. 50 No. 4, 1997, pp. 877-904.

Jeon, J., "The Strengths and Limitations of the Statistical Modeling of Complex Social Phenomenon: Focusing on SEM, Path Analysis, or Multiple Regression Models. World Academy of Science, Engineering and Technology", *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, Vol. 9 No. 5, 2015, pp. 1597-1605.

Jetten, J., Duck, J., Terry, D.J., and O'brien, A., "Being attuned to intergroup differences in mergers: The role of aligned leaders for low-status groups", *Personality and Social Psychology Bulletin*, Vol. 28 No.9, 2002, pp. 1194-1201.

Jimmerson, C., *A3 problem solving for healthcare: a practical method for eliminating waste*, Productivity Press, New York, NY, 2007.

Jimmerson, C., Weber, D. and Sobek, D.K., "Reducing waste and errors: piloting lean principles at Intermountain Healthcare", *Joint Commission Journal on Quality and Patient Safety*, Vol. 31 No. 5, 2005, pp. 249-57.

Johansson, R., *Case study methodology*. Methodologies in Housing Research, Stockholm, 2003.

Joosten, T., Bongers, I. and Janssen, R., "Application of lean thinking to healthcare: issue and observations", *International journal for quality in healthcare: journal of the International Society for Quality in Healthcare / ISQua*, Vol. 21 No. 5, 2009, pp. 341-47.

Judd, C.M. and Kenny, D.A., "Process analysis: estimating mediation in treatment evaluations", *Evaluation Review*, Vol. 5 No. 3, 1981, pp. 602-619.

Karim, N.H.A., "The impact of work related variables on librarians' organizational commitment and job satisfaction", *Malaysian Journal of Library & Information Science*, Vol. 15, 2010, pp. 149-163.

Keating, E., Oliva, R., Repenning, N., Rockart, S., and Sterman, J., "Overcoming the improvement paradox", *European Management Journal*, Vol. 17 No. 2, 1999, pp. 120-134.

Kelley, K., Clark, B., Brown, V., and Sitzia, J., "Good practice in the conduct and reporting of survey research", *International Journal for Quality in Health Care*, Vol. 15 No. 3, 2003, pp. 261-266.

Kenny, D.A., Kashy, D.A. and Bolger, N., *Data analysis in social psychology*, in Gilbert, D.T., Fiske, S. and Lindzey, G. (Eds), *The Handbook of Social Psychology*, McGraw-Hill, New York, NY, 1998, pp. 233-65

Kidder, T., *Soui of a new machine*. New York: Avon, 1982.

Kim, C.S., Spahlinger, D.A., Kin, J.M., Coffey, R.J. and Billi, J.E., "Implementation of lean thinking: one health system's journey", *The Joint Commission Journal on Quality and Patient Safety*, Vol. 35 No. 8, 2009, pp. 406-413.

Kim, H.Y., Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restorative dentistry & endodontics*, Vol. 38 No. 1, 2013, pp. 52-54.

Kimsey, D.B., "Lean methodology in healthcare", *AORN journal*, Vol. 92 No. 1, 2010, pp. 53-60.

Kinder, T., and Burgoyne, T., "Information processing and the challenges facing lean healthcare", *Financial Accountability & Management*, Vol. 29 No. 3, 2013, pp. 271-290.

Kirkman, B.L., and Rosen, B., "Beyond self-management: Antecedents and consequences of team empowerment", *Academy of Management journal*, Vol. 42 No. 1, 1999, pp. 58-74.

Klein, K.J. and Kozlowski, S.W.J., *Multilevel Theory, Research, and Methods in Organizations: Foundations, Extensions, and New Directions*, Jossey-Bass, San Francisco, CA, 2000.

Krishna, N.V. and Kodali, J.R., "A literature review of empirical research methodology in lean manufacturing", *International Journal of Operations & Production Management*, Vol. 34 No. 8, 2014, pp. 1080-1122.

Kvarnström, S., "Difficulties in collaboration: a critical incident study of interprofessional healthcare teamwork", *Journal of Interprofessional Care*, Vol. 22 No. 2, 2008, pp. 191-203.

Langabeer, J.R., DelliFraine, J.L., Heineke, J. and Abbass, I., "Implementation of Lean and Six Sigma quality initiatives in hospitals: A goal theoretic perspective". *Operations Management Research*, Vol. 2 No. 1, 2009, pp. 13-27.

Latham, G.P., Borgogni, L., and Petitta, L., "Goal setting and performance management in the public sector", *International Public Management Journal*, Vol. 11 No. 4, 2008, pp. 385-403.

Laureani, A., Brady, M. and Antony, J., "Applications of lean six sigma in an Irish hospital", *Leadership in Health Services*, Vol. 26 No. 4, 2013, pp. 322-337.

Lee, C.H. and Bruvold, N.T., "Creating value for employees: investment in employee development", *The International Journal of Human Resource Management*, Vol. 14 No. 6, 2003, pp. 981-1000.

Lee, P.K., To, W.M., and Billy, T.W., "Team attributes and performance of operational service teams: An empirical taxonomy development", *International Journal of Production Economics*, Vol. 142 No.1, 2013, pp. 51-60.

Leeuw, E.D.D., Hox, J.J. and Dillman, D.A., *International Handbook of Survey Methodology*, Taylor & Francis Group, New York, NY, 2008.

Lemieux-Charles, L. and McGuire, W.L., "What do we know about healthcare team effectiveness? A review of the literature", *Medical Care Research and Review*, Vol. 63 No. 3, 2006, pp. 263-300.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S. and Rao, S.S., "Development and validation of a measurement for studying supply chain management practices", *Journal of Operations Management*, Vol. 23, 2005, pp. 618-41.

Liker, J.K., *The Toyota Way*, McGraw-Hill, New York, NY, 2004

Liu, G., Shah, R. and Schroeder, R.G., "Linking work design to mass customization: a socio-technical systems perspective", *Decision Sciences*, Vol. 37 No. 4, 2006, pp. 519-545.

Ljungblom, M., "Ethics and Lean Management—a paradox?", *International Journal of Quality and Service Sciences*, Vol. 6 No. 2/3, 2014, pp. 191-202.

Locke, E.A., "Job satisfaction and job performance: a theoretical analysis", *Organisational Behaviour and Human Performance*, Vol. 5, 1970, pp. 484-500.

Longenecker, P.D., and Longenecker, C.O., "Why hospital improvement efforts fail: a view from the front line", *Journal of Healthcare Management*, Vol. 59 No. 2, 2014, pp. 147-157.

Longo, F., and Cantù, E., "Dove sta andando il SSN: evidenze dal Rapporto OASI 2013." Cergas-Bocconi (Ed.), Rapporto OASI, 2013, pp. 1-24.

MacKinnon, D.P. and Fritz, M.S., "Distribution of the product confidence limits for the indirect effect: program PRODCLIN", *Behavior Research Methods*, Vol. 39 No. 3, 2007, pp. 384-389.

MacKinnon, D.P. , Krull, J.L. and Lockwood, C.M., "Equivalence of the mediation, confounding and suppression effect", *Prevention Science*, Vol. 1 No. 4, 2000, pp. 173-181.

Makary, M.A., Sexton, J.B. and Freischlag, J.A., "Operating room teamwork among physicians and nurses: teamwork in the eye of the beholder", *Journal of the American College of Surgeons*, Vol. 202 No. 5, 2006, pp. 746-52.

- Manetje, O. and Martins, N., "The relationship between organizational culture and organizational commitment", *Southern African Business Review*, Vol. 13 No. 1, 2009, pp. 87-111.
- Mansfield, E.R., and Helms, B.P., "Detecting multicollinearity", *The American Statistician*, Vol. 36 No. 3a, 1982, pp. 158-160.
- Mazzocato, P., Savage, C., Brommels, M., Aronsson, H. and Thor, J., "Lean thinking in healthcare: a realist review of the literature", *Quality and Safety in Healthcare*, Vol. 19 No. 5, 2010, pp. 376-382.
- McDermott, A.M., Kidd, P., Gately, M., Casey, R., Burke, H., O'Donnell, P., ... and O'Brien, T., "Restructuring of the Diabetes Day Centre: a pilot lean project in a tertiary referral centre in the West of Ireland", *BMJ quality & safety*, Vol. 22 No. 8, 2013, pp. 681-688.
- McDonald, R.P., and Ho, M.H.R., "Principles and practice in reporting structural equation analyses", *Psychological methods*, Vol. 7 No. 1, 2002, pp. 64-82.
- McIntosh, B. , Sheppy, B. and Cohen, I., "Illusion or delusion-Lean management in the health sector", *International Journal of Health Care Quality Assurance* , Vol. 27 No. 6, 2014, pp. 482-492.
- McGrath, J.E. (1964), *Social psychology: A brief introduction*. Holt, Rinehart and Winston, New York, NY, 1964.
- Melrose, M. J., "Maximizing the rigor of action research: why would you want to? How could you?", *Field Methods*, Vol. 13 No. 2, 2001, pp.160-180.
- Meredith, J., "Building operations management theory through case and field research", *Journal of Operations Management*, Vol. 16, 1998, pp. 441-54.
- Mickan, S.M., "Evaluating the effectiveness of healthcare teams", *Australian Health Review*, Vol. 29 No. 2, 2005, pp. 211-217.
- Mickan, S. and Rodger, S., "Characteristics of effective teams: a literature review", *Australian Health Review*, Vol. 23 No. 3, 2000, pp. 201-208.
- Mosadeghrad, A.M., "Obstacles to TQM success in health care systems", *International Journal of Health Care Quality Assurance*, Vol. 26 No. 2, 2013, pp. 147-173.
- Moody, D, *Empirical research methods*. Research Methods Class, Monash University, Melbourne, Australia, 2002.
- Molleman, E., "The multilevel nature of team-based work research", *Team Performance Management*, Vol. 11 Nos 3/4), 2005, pp. 113–124.

Natale, J., Uppal, R., and Wang, S., “Improving Kaizen event success in healthcare through shorter event duration”, *International Journal of Collaborative Enterprise*, Vol. 4 Nos 1/2), 2014, pp. 3-16.

Nazari, J., Kline, T., and Herremans, I., “Conducting survey research in management accounting”, *Methodological issues in accounting research: Theories and methods*, 2006, pp. 427-459.

Neter, J., Kutner, M.H., Nachtsheim, C.J., and Wasserman, W., *Applied Linear Statistical Models*, fourth ed. McGraw-Hill Companies Inc., New York, 1996.

Nicolini, D., “In search of project chemistry”, *Construction Management & Economics*, Vol. 20 No. 2, 2001, pp. 167-177.

Nijhof, W.J., de Jong, M.J., and Beukhof, G., “Employee commitment in changing organizations: an exploration”, *Journal of European Industrial Training*, Vol. 22 No. 6, 1998, pp. 243-248

Nunnally, J.D., *Psychometric Theory*, second ed. McGraw-Hill, New York, 1978.

O’Brien, R. M., “A caution regarding rules of thumb for variance inflation factors”, *Quality & Quantity*, Vol. 41 No 5, 2007, pp. 673-690.

Parker, S. K., Wall, T. D., and Cordery, J. L., “Future work design research and practice: towards an elaborated model of work design”, *Journal of Occupational and Organizational Psychology*, Vol 74, 2001, pp. 413-440.

Pasmore, W., *Designing Effective Organizations: The Socio-Technical Systems Perspective*, Wiley, New York, NY, 1988.

Pinsonneault, A., and Kraemer, K., “Survey research methodology in management information systems: an assessment”, *Journal of management information systems*, Vol. 10 No. 2, 1993, pp. 75-105.

Poksinska, B.B., Fialkowska-Filipek, M. and Engström, J., “Does Lean healthcare improve patient satisfaction? A mixed-method investigation into primary care”. *BMJ quality & safety*, 2016, bmjqs-2015.

Poksinska, B., “The current state of Lean implementation in healthcare: literature review”, *Quality Management in Healthcare*, Vol. 19 No. 4, 2010, pp. 319-329.

Raab, S.S., Andrew-JaJa, C., Condel, J.L. and Dabbs, D.J., “Improving Papanicolaou test quality and reducing medical errors by using Toyota production system methods”, *American journal of obstetrics and gynecology*, Vol. 194 No. 1, 2006, pp. 57-64.

Radnor, Z., "Implementing lean in healthcare: making the link between the approach, readiness and sustainability", *International Journal of Industrial Engineering and Management*, Vol. 2, 2011, pp. 1-12

Radnor, Z.J., Holweg, M. and Waring, J., "Lean in healthcare: the unfilled promise?", *Social science and medicine*, Vol. 74 No. 3, 2012, pp. 364-371.

Radnor, Z. and Walley, P., "Learning to walk before we try to run: adapting lean for the public sector", *Public and Money Management*, Vol. 28 No. 1, 2008, pp. 13-20.

Salant, P. and Dillman, D., *How to Conduct Your Own Survey*, Wiley, New York, NY, 1994.

Sawhney, R. and Chanson, S., "Human behavior based exploratory model for successful implementation of lean enterprise in industry", *Performance Improvement Quarterly*, Vol. 18 No. 2, 2005, pp. 76-96.

Schulz, A. K. D., "Experimental research method in a management accounting context", *Accounting & Finance*, Vol. 39 No. 1, 1999, pp. 29-51.

Sexton, J.B., *The better the team the safer the world: golden rules of group interaction in high risk environments: Evidence based suggestions for improving performance*, Ladenburg, Germany, 2004.

Shazali, N.A., Habidin, N.F., Ali, N., Khaidir, N.A., and Jamaludin, N.H., "Lean healthcare practice and healthcare performance in Malaysian healthcare industry", *International Journal of Scientific and Research Publications*, Vol. 3 No. 1, 2013, pp. 1-5.

Sheridan, J.H., Kaizen blitz. *Industry Week*, Vol. 246 No. 16, 1997, pp. 18-27.

Smith, G., Poteat-Godwin, A., Harrison, L.M. and Randolph, G.D., "Applying Lean principles and kaizen rapid improvement events in public health practice", *Journal of Public Health Management Practice*, Vol. 18 No. 1, 2012, pp. 52-54.

Sobek II, D.K. and Smalley, A., *Understanding A3 Thinking: A Critical Component of Toyota's PDCA Management*, Taylor & Francis, New York, NY, 2008.

Strecher, V. J., Seijts, G. H., Kok, G. J., Latham, G. P., Glasgow, R., DeVellis, B., ... and Bulger, D. W., "Goal setting as a strategy for health behavior change", *Health Education & Behavior*, Vol. 22 No. 2, 1995, pp. 190-200.

Sundstrom, E., McIntyre, M., Halfhill, T. and Richards, H. (2000), "Work groups: From the Hawthorne studies to work teams of the 1990s and beyond", *Group Dynamics: Theory, Research, and Practice*, Vol. 4 No. 1, 2000, pp. 44-67.

Tanco, M., Jaca, C., Viles, E., Mateo, R. and Santos, J., "Healthcare teamwork best practices: lessons for industry", *The TQM Journal*, Vol. 23 No. 6, 2011, pp. 598-610.

Tortorella, G.L., Viana, S. and Fettermann, D., "Learning cycles and focus groups: A complementary approach to the A3 thinking methodology", *The Learning Organization*, Vol. 22 No. 4, 2015, pp. 229-240.

Van Aken, E.M., Farris, A., Glover, W.J. and Letens, G., "A framework for designing, managing, and improving Kaizen", *International Journal of Productivity and Performance Management*, Vol. 59 No. 7, 2010, pp.641-67.

Van Teijlingen, E., and Hundley, V., "The importance of pilot studies", *Nursing Standard*, Vol. 16 No. 40, 2002, pp. 33-36

Van Vliet, E.J., Sermeus, W., Van Gaalen, C.M., Sol, J.C. and Vissers, J.M., "Efficacy and efficiency of a lean cataract pathway: a comparative study", *Quality and Safety in Healthcare*, 2010, qshc-2008.

Venkatraman, N., "Strategic orientation of business enterprises: The construct, dimensionality, and measurement", *Management Science*, Vol. 35 No. 8, 1989, pp. 942-962.

Ventresca, M. and Mohr, J., *Archival research methods*, 2002.

Visich, J. K., Wicks, A. M., and Zalila, F., "Practitioner perceptions of the A3 method for process improvement in health care", *Decision Sciences Journal of Innovative Education*, Vol. 8 No. 1, 2010, pp. 191-213.

Visser, P. S., Krosnick, J. A., and Lavrakas, P. J., *Survey research*, 2000.

Voss, C., Tsikriktsis, N., and Frohlich, M., "Case research in operations management", *International journal of operations & production management*, Vol. 22 No. 2, 2002, pp. 195-219.

Wacker, J.G. (1998), "A definition of theory: research guidelines for different theory-building research methods in operations management", *Journal of Operations Management*, Vol. 16 No. 4, 1998, pp. 361-85.

Waterman, H., Tillen, D., Dickson, R. and de Koning, K., "Action research: a systematic review and guidance for assessment", *Health Technology Assessment*, Vol. 5 No. 23, 2001.

West, M.A. and Lyubovnikova, J., "Illusions of team working in healthcare", *Journal of health organization and management*, Vol. 27 No. 1, 2013, pp. 134-142.

Xu, L. and Zhang, W.J., "Comparison of different methods for variable selection", *Analytica Chimica Acta* , Vol. 446 No. 1, 2001, pp. 477-483.

Yeatts, D.E. and Seward, R.R., “Reducing turnover and improving healthcare in nursing homes the potential effects of self-managed work teams”, *The Gerontologist*, Vol. 40 No. 3, 2000, pp. 358-363.

Yin, R.K., *Case Study Research: Design and Methods*, 4th ed., Sage Publications, Thousand Oaks, CA, 2008.

Young, T. and McClean, S., “A critical look at Lean Thinking in healthcare”, *Quality and Safety in Health Care*, Vol. 17, 2008, pp. 382-6.

Zeng, J., and Zhang, J., “Instill Lean A3 Thinking into Healthcare IT Services”, *International Journal of Business and Social Research*, Vol. 4 No. 8, 2014, pp. 1-7.

Appendix A

<i>Overall plan</i>

Proposed research

- To identify the critical success factor of the social system of continuous improvement initiatives in the healthcare sector.

Research question

- Which are the determinant factors of social system outcomes of continuous improvement initiatives in the healthcare sector?

Purpose

Many public healthcare organizations over the world implement the lean management using kaizen mechanism often referred as rapid improvement events, kaizen blitzes, A3 events and so on. However, most of these kaizen initiatives focus only on the improvement of technical performances (e.g. time/cost reduction, quality improvement) neglecting the social ones (e.g. motivation and development of human resources, commitment towards the lean transformation) although both outcomes should be achieved (Joosten et al., 2009) to consider a lean management effort be successful. Recently, many scholars (e.g., Joosten et al., 2009; Farris et al., 2009 and Sawhney and Chanson, 2005) emphasize the importance to assess the social outcomes and underline some critical success factors (CSF) to guarantee the achievement of such results; however, without any empirical basis. Therefore, it is needed to carry out empirical studies that focus on social outcomes of the healthcare context.

Methodology

The empirical analysis will be carried out within healthcare organizations that implement the lean management as their formally improvement strategy. The survey study will be performed in line with the following steps:

- The continuous improvement initiative coordinators will be interviewed to understand how the lean management is put in practice by employees in line with a structured interview. (See document: “*Coordinator interview*”).
- Two tested data collection instrument will be provided to the continuous improvement initiatives facilitators and team members. The continuous improvement coordinators will provide the questionnaire to facilitators according to the steps described in the document: “*How to complete questionnaires*”. The first instrument (“*Facilitator questionnaire*”) will be distributed to the continuous improvement facilitators that guided the continuous improvement initiatives. The second instrument (“*Team member questionnaire*”) will be distributed to team members that participated in the continuous improvement initiatives.

When the questionnaires will be completed, a continuous improvement facilitator or one of the evaluation team member will pass to gather them. Otherwise, continuous improvement facilitators are asked to send the questionnaires to the evaluation team electronically or by post in order to complete the database. This data will be used to statistically test the direct relationships between critical success factors and social outcomes of the continuous improvement initiatives in healthcare.

Appendix B

<p style="text-align: center;"><i>Survey Script:</i> <i>How to complete the questionnaires</i></p>
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Dear Continuous Improvement Coordinator

Please follow the instructions below when distributing the questionnaires to facilitators and team members.

- At first, I would ask you to identify the *continuous improvement initiative facilitators* who were the individuals that planned the initiative and provided guidance to the team during the project. Based on this role description, please provide both questionnaires to the facilitators of each continuous improvement initiative.
- Please ask *facilitators* to establish a *unique code* and to write this code on questionnaire 1 and 2 for each continuous improvement initiative. This code will help researchers to identify the continuous improvements initiatives involved in this study.
- Please ask *facilitators* to get an envelope and to write on it the code of the continuous improvement initiative. This envelope will be used later to collect the filled questionnaires related to each continuous improvement initiative.
- Please ask *facilitators* to fill *questionnaire 1* according to the continuous improvement initiative that they coordinated and guided.
- Furthermore, please ask *facilitators* to give the *questionnaire 2* to all *team members* of the continuous improvement initiative, if it is possible. The target is to obtain as many questionnaires as possible, but a minimum of 2 questionnaires from team members is required for each continuous improvement initiative.
- Please ask *facilitators* to collect both filled questionnaires (1 and 2) and then place them into the envelope to be sent to the coordinators.
- Additionally, please remind *facilitators* that their participation in this survey is voluntary and they can choose to stop participating at any time.
- Finally, please remind *facilitators* to communicate team members that their participation in this survey is voluntary and they can choose to stop participating at any time.

Thank you very much for your help and contribution to this research study.

Appendix C

Questionnaire N°1: Facilitator questionnaire

Dear continuous improvement facilitator,

This questionnaire aims to improve the implementation of continuous improvement initiatives within your healthcare organization.

As the “continuous improvement initiative” is defined as a structured project performed by a multi-disciplinary team with the aim of improving a targeted work area or process in a given timeframe, the objective of this questionnaire is to identify the critical success factors that impact on the improvement of the knowledge, skills and attitude of team members during the development and execution of the continuous improvement initiative. Your responses will be kept strictly confidential and be analysed in combination with the team member’s responses.

Please take a moment to frankly and honestly complete this survey, because some guidelines will be developed to improve the current strategy of lean management implementation in healthcare.

Thank you for your time and contribution to this evaluation.

Code:	_____
Profession:	_____
Title of continuous improvement initiative*:	_____
Hospital department:	_____

*Elective information

Code of continuous improvement initiative:						
Scale	N°	Questions		Measurement scale		
Work area routineness	1.	The work the target work area does is routine.	Strongly disagree	<input type="checkbox"/>	<input type="checkbox"/>	Strongly agree
	2.	The target work area provides the same service most of the time.	Strongly disagree	<input type="checkbox"/>	<input type="checkbox"/>	Strongly agree
	3.	A given service requires the same processing steps each time it is provided.	Strongly disagree	<input type="checkbox"/>	<input type="checkbox"/>	Strongly agree
Tool appropriateness	4.	(Respondents first listed the problem-solving tools used by the team). For each tool, please rate the team's use of the tool on appropriateness of using this tool to address the team's goals	Tool:	<input type="checkbox"/>	<input type="checkbox"/>	Very appropriate
			Very inappropriate	<input type="checkbox"/>	<input type="checkbox"/>	Very appropriate
			Tool:	<input type="checkbox"/>	<input type="checkbox"/>	Very appropriate
Tool quality	5.	(Uses the same tool list above.) For each tool, please rate the quality of the team's use of this tool.	Tool:	<input type="checkbox"/>	<input type="checkbox"/>	Excellent
			Very poor	<input type="checkbox"/>	<input type="checkbox"/>	Excellent
			Tool:	<input type="checkbox"/>	<input type="checkbox"/>	Excellent
Team kaizen experience	45.	Not including this initiative event, how many continuous improvement initiatives in total had team members participated in until this initiative?				
Team leader experience	7.	Including this initiative, how many initiatives has the team leader led or co- led in the past three years?				
Initiative Planning processes	6.	How many hours did you spend to plan this continuous improvement initiative?				
Team composition	7.	Please fill-in the number of continuous improvement initiative team members in each job category.	# Physicians			
			# Nurses			
			# Technicians			
			# Ward managers			
			# Medical directors			
			# others			
			# others			

Appendix D

Questionnaire N°2: Team member questionnaire

Dear participant,

This questionnaire aims to improve the implementation of continuous improvement initiatives within your healthcare organization.

As the “continuous improvement initiative” is defined as a structured project performed by a multi-disciplinary team with the aim of improving a targeted work area or process in a given timeframe, the objective of this questionnaire is to identify the critical success factors that impact on the improvement of your knowledge, skills and attitude during the development and execution of the continuous improvement initiatives. Your responses will be kept strictly confidential and be analysed in combination with other team member’s responses.

Please take a moment to frankly and honestly complete this survey, because some guidelines will be developed to improve the current strategy of lean management implementation in healthcare.

Thank you for your time and contribution to this evaluation.

Code:	_____
Profession:	_____
Title of continuous improvement initiative*:	_____
Hospital department:	_____

*Elective information

Scale	N°	Questions		Measurement scale						
Goal clarity	1.	Our team has clearly defined goals	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	2.	The performance targets our team must achieve to fulfil our goals are clear	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	3.	Our goals clearly define what is expected of our team	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	4.	Our entire team understand our goals	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
Goal difficulty	5.	Our team's improvement goals are difficult. (*)	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	6.	Meeting our team's improvement goals will be tough	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	7.	It will take a lot of skill to achieve our team's improvement goal	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	8.	It will be hard to improve this work area enough to achieve team's goals (*)	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
Affective commitment to change	9.	In general, members of our team believe in the value of this continuous improvement initiative.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	10.	Most of our team members think that this continuous improvement initiative is a good strategy for this work area.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	11.	In general, members of our team think that it is a mistake to hold this continuous improvement initiative. (*)	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	12.	Most of our team members that this continuous improvement initiative will serve an important purpose.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	13.	Most of our team members think that things will be better with this continuous improvement initiative.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	14.	In general, members of our team believe that this continuous improvement initiative is needed.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
Internal processes	15.	Our team communicated openly.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	16.	Our team valued each member's unique contributions.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	17.	Our team respected each other's opinions.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	18.	Our team respected each other's' feelings.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
	19.	Our team valued the diversity in our team members.	Strongly disagree	<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	Strongly agree
				<div><div></div></div> <div>1</div>	<div><div></div></div> <div>2</div>	<div><div></div></div> <div>3</div>	<div><div></div></div> <div>4</div>	<div><div></div></div> <div>5</div>	<div><div></div></div> <div>6</div>	

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Kaizen capabilities	38.	Most of our team members gained new skills as a result of participation in this continuous improvement initiative.	Strongly disagree	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	Strongly agree
	39.	In general, this continuous improvement initiative motivated the members of our team to perform better.	Strongly disagree	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	Strongly agree
	40.	Overall, this continuous improvement initiative increased our team members' interest in our work.	Strongly disagree	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	Strongly agree
Attitude	41.	Most of our team members liked being part of this continuous improvement initiative.	Strongly disagree	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	Strongly agree
	42.	Most members of our team would like to be part of continuous improvement initiatives in the future.	Strongly disagree	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	Strongly agree
	43.	In general, our continuous improvement initiative team members are comfortable working with others to identify improvements in this work area	Strongly disagree	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/> 6	Strongly agree
(*) the asterisk indicates the items that was removed from the original scale following the factor analysis.					

Appendix E

Spreadsheet for data collection

In this appendix, a guide is provided to set up the database which will be used to analyse the survey data. Initially, two spreadsheets were built to insert the data that were collected using the two questionnaires. Then, a final master spreadsheet was created to insert the final values of each scale considered in this study. In the following paragraphs, this procedure is explained exhaustively.

This appendix is organised as follows:

- Step 1: Before the development of the database
- Step 2: Development of the database
- Step 3: Enter the data
- Step 4: Clean the data
- Step 5: Analyse the data
- Step 6: Development of the master spreadsheet

Step 1: Before the development of the database

As the questionnaires from each continuous improvement initiative were collected in an envelope from more than one organization, please separate the envelopes according to each organization using a specific name. For example, “Case1” refers to one organization.

Once the envelopes were classified, please open each one and assign a number to each questionnaire of each envelope. This number should be written on the corner of each paper survey questionnaire. Repeat this procedure one by one for all envelopes that were collected in each organization.

Step 2: Development of the database

During the data collection phase, two questionnaires were used (i.e., team members’ questionnaire and facilitator’s questionnaire). Therefore, two worksheets are needed to be created to insert the raw data. The development of each database is conducted as follows:

- Open two worksheets and call it: “DatabaseTeammembers” and “DatabaseFacilitators.” In these spreadsheets, the data collected using the two questionnaires will be inserted.
- In the first worksheet (i.e., DatabaseTeammembers), please type the column headers to identify the Team members’ questionnaires and the survey questions as follows:

- The first column is for Org.ID which is the specific name that was assigned when the envelopes were classified.
 - The second column is for the TeamID which is the code of each continuous improvement initiative that was assigned by the facilitator.
 - The third column is for the IDQ which is the code of each continuous improvement initiative followed by the number that was assigned to identify each team member's questionnaire.
 - The fourth column is for the title of the continuous improvement initiative
 - The fifth column. is for the healthcare functional category of the team members that participate in the kaizen initiative.
 - The sixth column is for the number of participations of each team member.
 - From the seventh column, please type the column headers for each question of the Team members' questionnaire. Each of these column headers must be written using the first letters of the scale name and the number of each item that were used to measure this scale. For instance, "GC1" refers to the first item in the Goal Clarity scale. Follow this procedure until all questions of the questionnaire are labelled.
- In the second worksheet (i.e., DatabaseFacilitators), please type the column headers to identify the Facilitator's questionnaires and the survey questions as follows:
- The first column is for Org.ID which is the specific name that was assigned when the envelopes were classified.
 - The second column is for the TeamID which is the code of each continuous improvement initiative that was assigned by the facilitator.
 - The third column is for the healthcare profession of the lean facilitator that guide the kaizen initiative.
 - The fourth column is for the title of the continuous improvement initiative.
 - The fifth column, please type the column headers for each question of the Facilitators' questionnaire. Each of these column headers must be written using the first letters of the scale name. In case the scale is measured using more than one item, please type these column headers using the first letters of the scale and the number of each item that were used to measure this scale. For instance, "WAR1" refers to the first item in the Work area routineness scale. Follow this procedure until all questions of the questionnaire are labelled. Apart from typing the headers for the items, please type column headers according to the number of lean tools that were considered to answer the items related to the tool quality and tool appropriateness scales.
 - Finally, please type two column headers to report the team size and the team members 'responses.

In figure E2, the final two worksheets that were created following the above sub steps are shown.

The figure displays two Excel worksheets from a database named 'DatabaseKaizen initiatives'.

The top worksheet, 'DatabaseTeamMembers', has the following structure:

1	A	B	C	D	E	F
	Org.ID	TeamID	IDQ	Title of continuous improvement initiative	Healthcare functional category	Team Member Kaizen E
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
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22						
23						
24						
25						
26						
27						

The bottom worksheet, 'DatabaseFacilitators', has the following structure:

1	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
	Org.ID	TeamID	Profession	Title of continuous improvement initiative	WAR1	WAR2	WAR3	TQ1	TQ2	TQ3	TAP1	TAP2	TAP3	Tool1	Tool2	Tool3	TKE	TLE	IPP	TFH	Team size	Team members' responses
2																						
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						
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26																						
27																						

Figure E1: Examples of the worksheets developed for this study

Step 3: Enter the Raw data

Once the column headers of the worksheet named “DatabaseTeammembers” are already typed, enter the data, beginning with the Row 2. The cells must be filled from left to right direction.

- First, as the envelopes were classified according to each engaged organization, please enter in this cell the assigned Org.ID name.
- Second, please insert in this cell the TeamID code of each continuous improvement initiative that was assigned by the facilitator. This code is written in the cover page of the team member’s questionnaire.
- Third, please type in this cell the assigned IDQ code of each team members’ questionnaire.

- Fourth, please type the title of the continuous improvement initiative. This response is also written in the cover page of the facilitator's questionnaire.
- Fifth, please insert the functional categories of the team member within the healthcare organization. These responses were written in the facilitator questionnaire and must be compared with the professional information provided by the team members that filled the team members' questionnaire.
- Sixth, please enter the number of participations of all team members before assess the mean value. Although these data were not asked to the team members, please ask facilitators to provide the data that they use to assess the team kaizen experience.
- From the seventh cell in the current row, please type the responses according to the column headers established before.

Similarly, once the column headers of the worksheet named "DatabaseFacilitators" are already typed, enter the data, beginning with the Row 2. The cells must be filled from left to right direction.

- First, as the envelopes were classified according to each engaged organization, please enter in this cell the assigned Org.ID name.
- Second, please insert in this cell the TeamID code of each continuous improvement initiative that was assigned by the facilitator. This code is written in the cover page of the facilitator's questionnaire.
- Third, please type the healthcare profession of the lean facilitator that guide the kaizen initiative.
- Fourth, please type the title of the continuous improvement initiative. This response is also written in the cover page of the facilitator's questionnaire.
- From the fifth cell in the current row, please type the responses according to the column headers established before. To complete the column of the team member size, please ask the facilitator to provide these data.

While entering the data, some unexpected problems may be encountered (e.g., lack of answers, two responses for one question). To deal with these problems, please use the following solutions:

- If a question is not answered, please leave the cell for the unanswered question blank.
- If the respondent missed an entire page of the questionnaire, contact respondent through the facilitator again to complete the survey. Otherwise, leave the cells for the unanswered question blank.
- If two responses were selected for a question when only one is requested, please invalidate this answer and treat the question as if it were not answered.

Remember control that the values do not exceed the maximum and the minimum value of the Likert scale using the max and min function of excel.

Step 4: Clean the data

Following the compilation of both Excel spreadsheets, data were further screened to determine whether the data collected using the team member's questionnaire could be used to validate the scales measured using the 6-point Likert scale.

The screening process consists on verifying: first, the survey fatigue (i.e., whether the respondents answered the survey questions using the same value without giving careful thought due to time constraints) and second, the variation of the responses from the question 19 to the question 35 of the team members' questionnaire. Questionnaires with zero variation must be removed.

Step 5: Calculations of study variables

Following the study of Farris et al. (2009), some calculations were performed to calculate the study variables from the raw data of both questionnaires. These variables included: team kaizen experience, team leader experience, work area routineness, team functional heterogeneity, tool appropriateness and tool quality. In the following table E1, it is explained how the value of these variables must be assessed.

Table E1: Calculation of team level variables

SCALE	Measure	Final value
Team kaizen experience	Continuous	Calculate the team average of the team members' participation in previous kaizen initiatives plus one using the data from reported in the "DataTeammembers" worksheet.
Work area routineness	6-point Likert type	Calculate the average value for the items.
Team functional heterogeneity	Continuous	<p>The job category of the healthcare workers that participate to kaizen initiatives are reported in DataTeammembers" worksheet.</p> <p>Please calculate the proportion considering the all reported job categories.</p> <p>Then, calculate as follows, where p_i is the proportion of team members from each functional category and H is the value for the team functional heterogeneity.</p> $H = \sum_i p_i (\log(1/p_i))$
Tool appropriateness and Tool quality	6-point Likert type	Calculate the average rating for all tools listed

The final values of the above scales will be inserted in the master spreadsheet that contain only the variables to be used in the team-level analysis.

Step 6: Data analysis for the individual responses

Before conducting the construct validity test of the 6-point Likert scales of the team member questionnaire, a final check of the missing values was carried out as follows:

- When some missing values were encountered, these were completed by assessing the mean value of the item responses provided by the other questionnaires of the same team.
- Rather, when no team member answered to an item of the individual questionnaire, the mean value of all item responses was used to complete these missing values.

After verifying the no presence of missing values, the construct validity assessment can be carried out to verify the degree to which the used items appear to measure the same scale and are relatively correlated among themselves. In this way, it is provided evidence that scales are valid measures of unique variables and can be used for further analysis. This analysis depends on the decisions about following a confirmatory factor analysis or an exploratory factor analysis (more details see Hair et al., 1998). Based on the results of the construct validity and the factor analysis, it is only considered the items that overcome the cut-off values suggested in literature to validate the measurements (More details see Li et al., 2005). Particularly, in this study a confirmatory factor analysis was conducted and as part of the results of the construct validity five items were removed: GD1, ACC3, MS3, MS4, AO4. These items were not considered in the subsequently analysis.

Additionally, as the unit of analysis in this study is the team, the individual data is needed to be aggregated to a team level. To justified the data aggregation, two tests are performed: the intraclass correlation coefficient (ICC(1)) and the interrater agreement (r_{wg}) for each revised scale (more details see Klein and Kozlowski, 2000). The overcome of the threshold of both tests (i.e., ICC (1) and r_{wg} allowed to conclude that there are strong team level properties which support the data aggregation.

When the team level properties are demonstrated for the scales of the 6-point Likert scales of the team member questionnaire, the data aggregation process for all scales reported in table E2 is performed as follows:

- First, please calculate the average value of the items that positively overcome the construct validity assessment for each team member. For instance, the average value of goal clarity (GC) for each team member is calculated by assessing the mean value of (GC1, GC2, GC3 and GC4).
- Second, please assess the team-level average for each scale considering the average value of the responses of team members. For instance, the team-level average for goal clarity (GC) is calculated by assessing the mean value of the average value of

goal clarity of each team member. These team mean values will be used to fill the final master spreadsheet for the parametric or non-parametric further studies.

Table E2: Calculation of the scales at team-level

SCALE	Measure	Final value
Goal Clarity	6-point Likert type	Team average for scale
Goal difficulty	6-point Likert type	Team average for scale
Team Autonomy	6-point Likert type	Team average for scale
Management support	6-point Likert type	Team average for scale
Affective commitment to change	6-point Likert type	Team average for scale
Internal processes	6-point Likert type	Team average for scale
Action orientation	6-point Likert type	Team average for scale
Kaizen capabilities	6-point Likert type	Team average for scale
Attitude	6-point Likert type	Team average for scale

Step 7: Development of the master spreadsheet

Finally, the master spreadsheet is built to collect the data that will be used to test the relations between the variables. This worksheet is developed as follows:

- Open a worksheet and call it: “MasterDatabase” and then type the column headers to identify the data of each Team involved in this study.
 - The first column is for Org.ID which is the specific name that was assigned when the envelopes were classified.
 - The second column is for the TeamID which is the code of each continuous improvement initiative that was assigned by the facilitator.
 - The third column is for title of the continuous improvement initiative
 - From the fourth column to the ninth, please type the column headers for each scale by writing the first letters of the scale name. For instance, “GC” refers to the Goal Clarity scale. Follow this procedure until all scales of the team member’s questionnaires, that were measured, are labelled.
 - From the tenth column, please type the column headers for the scales that were measured using the facilitator’s questionnaire. For instance, “WAR” refers to the Work Area Routineness scale.
 - Additionally, type the column header for the team size (i.e., Team size) at the seventeenth column. This value was provided by the facilitators.

Once all the column headers are typed, the final values of each scale that were calculated before (see table E1 and E2) must be inserted.

Finally, the normal distributions of the variables inserted in the master spreadsheet should be verified, as the assumption of the normality is relevant to conduct parametric analyses (i.e., regression analysis). In this study, the assessment of the normal distribution of the variables were verified using the z-values of skewness and kurtosis ($z < 3.29$) (Kim, 2013)

and the graphical method. The variables that are strongly non-normal distributed were transformed using a log transformation (Hair et al., 1998; Neter et al., 1996).

Among the variables in the Master spreadsheet, it was found that the distribution of the variables demonstrated non-severe departures from normality distribution, except for the following variables: team leader experience, team kaizen experience and even planning process. To respect the normal assumption, a log transformation was run to normalize the data and control for the skewness of the distribution in order to prepare them for subsequent analysis.