Lean implementation and sustainability: a classification model of the main organizational barriers and enablers

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Abstract: The barriers and enablers to implement lean have been researched by different scholars in this field. This paper reviews this literature and presents a classification model of barriers and enablers into seven organizational elements divided in technical and cultural aspects. These results inform further empirical research about lean implementation.

Keywords: Lean barriers and enablers, organizational aspects, lean implementation and sustainability.

INTRODUCTION

Since Toyota started their production system philosophy in the mid 50's and lean became popularised with the book 'THE MACHINE THAT CHANGED THE WORLD', lean has been implemented for a great number of companies. The benefits of lean in manufacturing companies influenced the possibility to spread the philosophy in different sectors, principally across the services areas (Bowen and Youngdahl, 1998). These areas have implemented lean in different ways, and most of them have witnessed its benefits.

Regardless of the popularity and benefits of lean, there is a part of the literature that reports about the unsuccessful lean initiatives. Schipper and Swets (2010) present results from practitioners in their book confirming that the success rate of the lean implementation is around 30%. This low rate in successful lean implementations can be related to several hurdles faced during the lean journey, but also with the lack of some enablers to enhance the chances of succeed in terms of implementation and sustainability. Thus, some scholars have identified the barriers as well as the enablers which can help companies to understand the situation and overcome such difficulties (Bateman and Rich, 2003; Bhasin, 2012c; Radnor *et al.,* 2006).

The lean barriers and enablers have been studied for different researchers in different areas such as manufacturing, public service, healthcare, construction and education. Analyzing outcomes from these research it is possible to find a common trend in generating lists of barriers

and enablers about lean implementation and sustainability (Hilton and Sohal 2012; Mostafa *et al.* 2013), which can be helpful for companies who want to embark into the lean journey.

Nevertheless, there is a relevant step in this process, which is to understand the routes and concentration of these barriers and enablers within the organizational structure. Thus, a classification of these barriers and enablers can bring an understanding about which area experiences the most impact during the lean journey. Understanding the impact of barriers and enablers within the organizational structure can support the senior leadership to dedicate the right resources and provide support for this areas in terms of ease these hinders.

This paper aims to undertake a comprehensive analysis of the barriers and enablers to implement lean, providing a classification of these barriers enablers considering elements of the organizational structure. The methodology carried out to achieve the paper's aim was a systematic literature review in academic articles.

Research Methodology

The methodology of this paper is based on a systematic literature review, about the barriers and enablers to implement and sustained lean projects across the manufacturing and services areas. To access this secondary data, the researchers explored academic and professional articles published in several databases, such as Science Direct, Emerald, Springer Link, Google Scholar and Taylor Francis Online, including others.

The publication's period considered for the search followed the availability of the papers from 1996 to 2015. The criteria defined to carry out the searches were based on the saturation of the following key words: lean barriers, enablers, challenges, obstacles and constraints. The selection of the literature was carried out in two phases, firstly a searching results considering title, abstract and key words showed about 180 papers. The second phase considering a rigorous screening process of data, the number of papers selected was reduced to 115 papers.

Lean Barriers and Enablers

There is no a unique recipe to implement lean and succeed, indeed every organization is different in terms of sector, product and service. Thus, a replication of another organization lean process is a pitfall, since lean is context dependent, and the cultures, organisational pressures and supporting infrastructures vary between companies (Bhasin, 2012b; Radnor and Osborne, 2012).

Understanding the hurdles to implement lean and identify the strengths to sustain the lean journey is crucial in order to succeed. The barriers and enablers to implement lean, which can constraint or support the philosophy to became a strong process improvement technique across the organization, were identified in different areas, such as public services (Radnor *et al.*, 2006), healthcare system (Brandao de Souza and Pidd, 2011), manufacturing (Bhasin, 2012a) and IT service sector (Kundu and Manohar, 2012), among others.

The barriers act inhibiting the lean journey across the organization, some examples rely in lack of communication, leadership resistance and resources shortage (Jadhav *et al.* 2014a; Radnor *et al.,* 2006). On the other hand, enablers act supporting the implementation and sustaining the long-term process, some examples are strong organizational culture, management commitment and understanding as well as effective communication (Bateman and Rich, 2003; Bhasin, 2012c; Malmbrandt and Ahlstrom, 2013).

Each of these barriers and enablers are part of an area within the organization, thus, a classification of those barriers and enablers can bring an understanding about their impact in cultural and technical aspects, supporting top managers to make the right decision during lean implementation.

Organizational Elements

There are a considerable number of barriers and enablers reported by different authors, it consolidates into a large list from different areas but without a classification in terms of organizational aspects.

As a tentative approach to bring a new understanding about the classification of lean barriers and enablers within the organization, this paper adapts the 'Lean Iceberg Model' (Figure 1) developed by Hines *et al.* (2008). It addresses the five original elements presented by the authors' model, but also it includes two new elements that will support the classification of lean barriers and enablers. The elements are classified in technical and cultural aspects, where strategy and alignment, leadership and behavior are defined as cultural aspects; and processes, technology, training and resources are related to technical aspects. The elements training and resources are not part of the original Hines model, but they were included to provide a broad classification of the lean barriers and enablers.

In the original model Hines *et al.* (2008) present the technical and cultural aspects with focus on enablers for lean implementation, however the literature reviewed (Bateman and Rich, 2003; Brandao de Souza and Pidd, 2011; Radnor and Walley, 2008) showed that these aspects are also related to barriers. Thus, it is relevant an analysis and classification of the lean enablers and barriers considering those elements first proposed by Hines *et al.* (2008), but also including the two new elements, training and resources as part of a comprehensive model. The adoption of this model to classify the barriers and enablers is justified due the ability of these elements in covering the technical and cultural aspects of the organization.

TECHINICAL ASPECTS

Technical aspects are less related to human's aspects, but their role relies in provide support for the organization during the lean implementation. This support can be in terms of lean tools, technology to facilitate process or overcome barriers and performance control, among others. There are four technical organization elements to be addressed in terms of technical aspects, they are processes, technology and tools, training as well as resources.

Processes

Process is about the company's core activities, how they perform it and manage the relationship with their partners. Things that are important to consider when looking to a business process, is to understand what process is the key for the business and how to design and optimize the key processes to delivery value to the customer (Hines *et al.* 2008).

There are a variety of barriers and enablers encountered within the processes, some examples are related to lack of focus on customer and process (Radnor, 2010a) or establishment of a strong supplier partnership (Bortolotti *et al.,* 2015).

Technology and Tools

Lean implementation is not only the application of a set of tools and techniques, approaches that have this view are misunderstanding the nature of the philosophy (Boyer and Sovilla, 2003). However, the lean implementation is dependent of specific tools and technologies in order to achieve sustainability before and after implementation. Hines *et al.* (2008) argue that tools should be 'pulled', not 'pushed' by the customer, business and people within the business.

In terms of technology and tools acting as barriers and enablers, the literature revealed several of them, such as adequate IT support and infrastructure established of continuous improvement, lack of methodology and technological challenges (Bhasin, 2012c).

New Elements Within the Classification Model

The original model designed by Hines *et al.* (2008) does not consider the elements training and resources as part of the model (Figure 2). However, the majority of the literature in this field depicts about barriers and enablers connected with those elements (Bateman and Rich, 2003; Bhasin, 2012a; Marodin and Saurin (2015a). Adding such elements in this classification model will provide a more comprehensive understanding about the classification of the barriers and enablers to implement lean.

Training

During the process of literature review, several papers indicated hinders related to lack of technical knowledge and skills to guide lean implementation (Lean Enterprise Institute, 2007; Marodin and Saurin, 2015a). This situation has a relevant impact in the lean journey, mainly because organizations that do not know how to use the lean concept will face constraints to implement and sustain the lean system (Wendel and Abdulhalim, 2014).

There are relevant enablers related to training elements, for example, but not limited to, training culture, multitask and self development (Bhasin, 2013, Radnor, 2010a). On the other hand, examples of barriers have a concentration in the lack of knowledge and training (Jadhav *et al.* 2014a; Wendel and Abdulhalim, 2014).

Resources

The lean journey is dependent of resources, these are basically related to human and financial resources. To promote the lean implementation and achieve the benefits that lean can bring, it is necessary to provide the right resources, such as financial investment, material, training, time and human resources.

To provide an example of the barriers related to resources, the Canadian Manufactures and Exporters (2006) carried out a survey with manufacturing companies and it showed that lack of time, human and financial resources are obstacles to effective lean implementation. In other words, if these resources are available during the lean transformation they will have an opposite effect acting as enablers (Bhasin, 2013; Bateman and Rich, 2003).

CULTURAL ASPECTS

After years of lean implementations in different areas, there is an understanding that lean is a journey that takes time and requires change in behaviour, people need time to engage with and embed ideas (Radnor, 2010b; Radnor and Walley, 2008). In this lean journey, the human aspects play essential role and it has high dependency of the cultural aspects such as strategy, leadership and behaviour.

Strategy and Alignment

All elements are important, but strategy and alignment of the organization can be considered crucial for a successful lean implementation and sustainability. It is the foundation of the organization, and a well-defined vision and purpose are part of a strong strategy and alignment, thus failures in provide the correct strategy and alignment will rely in barriers that will hinder lean implementation, such as lack of understanding about lean as a direction (Karlsson and Åhlström, 1996). On the contrary, enablers from this element can create strengths for lean sustainability, such as promoting the involvement of all parties to secure ownership (Bhasin, 2012c).

Leadership

The leadership is the organizational aspect that leads the lean transformation across the organization. Hines *et al.* (2008) argue that many organizations possess managers and supervisors but do not have leaders who have a guiding vision, passion and integrity to lead changes and focus on people.

In order to achieve successful lean implementation and avoid pitfalls, the leadership team that includes executives, middle managers and shop floor leaders have to be consistent with the lean values, keeping the long-term vision. The literature reveals that leadership can be the strength of the lean journeys, but also the reason of its failure (Bhasin, 2012a; Brandao de Souza and Pidd, 2011; Radnor *et al.,* 2006).

Behaviour and Engagement

This element addresses the people's behaviour and company's culture, which will rely in the organization engagement. It is essential to have people and company's engagement, as this can help to predict their behaviour as well as factors for success (Hines *et al.,* 2008).

The strong part of this element relies in aspects related to culture which will influence people's behaviour. Some barriers found about this element are related to backsliding to old ways of doing and convince staff that lean can work in healthcare area (Canadian Manufactures and Exporters, 2006; Kim *et al.* 2007). The enablers are related to a culture that creates the involvement of everyone in the organization and holistic approach of lean as an entire value system, embracing every day improvement (Andersen *et al.* 2014; Radnor and Walley, 2008).

RESULTS

The literature reviewed shows that there are several types of barriers and enablers to implement and sustain lean. Most of the authors have presented similar lists of these barriers and

enablers, however finding the classification of those barriers and enablers within the organization still a challenge.

Table 1 – Organizational Barriers and Enablers

Organizational Elements		Barriers	Enablers	Sources
Technical Aspects	Processes	Demand uncertainly	Infrastructural elements	Doolen and Hacker (2005); Malmbrandt and Ahlstrom (2013)
		Supply chain characteristics	Matching demand and capacity levels	Al-Balushi (2014); Portioli-Staudacher and Tantardini (2012)
		Weak supplier performance	Continuous improvement	Bortolotti *et al.* (2014); Zimmermann and Bollbach (2015)
	Technology and Tools	Lack of lean experience	Visual information management system	Marodin *et al.* (2015b); Wahab *et al.* 2013
		Lean terminology	Measures and measurement systems	Bateman and Rich (2003); Brandao de Souza and Pidd (2011)
		Lack of consultants in the field	Process investigation VSM	Andersen and Røvik (2015); Mostafa *et al.* (2013)
	Training	Lack of lean understanding	Training culture	Hilton and Sohal (2012); Bhasin (2013)
		Lack of people development	Personnel training and involvement in lean principles and methods	Al-Balushi (2014); Poksinska (2010)
		Insufficient workforce implementation skills	Understanding of the lean tools	Bhasin (2012a); Mostafa *et al.* (2013)
	Resources	Lack of human resources	Dedicates full time resources for lean	Marodin and Saurin (2015a); Sisson and Elshennawy (2015)
		Financial resources constraints	Availability of resources	Bateman and Rich (2003); Radnor *et al.* (2006)
		Lack of time	Resources and capabilities	Mirzaei (2011); Pedersen and Rahbek (2011)
Cultural Aspects	Strategy and Alignment	Poor Communication	Clear communication	Lucey *et al.* (2005); Radnor *et al.* (2006)
		Lack of strategy perspective	Clarity of vision	Bhasin (2013); Hines *et al.* (2004)
		Lean viewed as a Fad	Involvement of all parties (ownership)	Bhasin (2012c); Lean Enterprise Institute (2007)
	Leadership	The lack of leadership team involvement	Top management support	Emiliani and Stec (2005); Massey and Williams (2005)
		lack of employees empowerment	Leadership empowering the workforce	Dickson *et al.* (2009); Papadopoulou and Ozbayrak (2004)
		Managerial Style	Management commitment (buy-in)	Portioli-Staudacher and Tantardini (2012); Radnor *et al.* (2006)
	Behaviour and Engagement	Lack of engagement	A culture that creates people involvement	Radnor and Walley (2008); Sisson and Elshennawy (2015)
		Resistance to change	Improvement Culture	Albliwi *et al.* (2014); Dombrowski and Mielke (2014)
		Organizational Culture and structure	Employee commitment (buy-in)	Malmbrandt and Ahlstrom (2013); Radnor and Boaden (2008)

In this paper 115 articles were analyzed, generating a considerable data, which includes long lists of barriers and enablers, which were in someway similar. Thereby, as a tentative to classify part of this information and provide an example of how this can be part of the organization, the table 1 depicts these barriers and enablers organized within the organizational elements. It is important to highlight that due table size constraints, only three examples per element were presented.

After an analysis of the papers content a list with more than 650 enablers and barriers has been created, most of them similar with slight differences in definition. An analysis within this list has revealed that 31% of the findings were related to enablers and 69% to barriers.

These findings are classified in cultural and technical aspects. The cultural aspects have the major impact within the literature reviewed, representing 64% of the barriers and 62% of the enablers found. On the other hand, technical aspects are less representative, with 38% of the barriers and 36% of the enablers found.

This concentration of barriers and enablers in cultural aspects can be justified analyzing the adapted lean iceberg model (Figure 1). It shows that cultural aspects are difficult to see as they are above the waterline, these are issues that people have difficult to understand and see, especially because the intangibility of this aspect. On the other hand, the technical aspects can be considered easier to deal with, they are more related to visible and tangible issues that are above the waterline. This can be defined as a trend of "*toolism*" during the lean journey, where it is easier to tackle problems related to technical aspects, as they are visible and less difficult to solve.
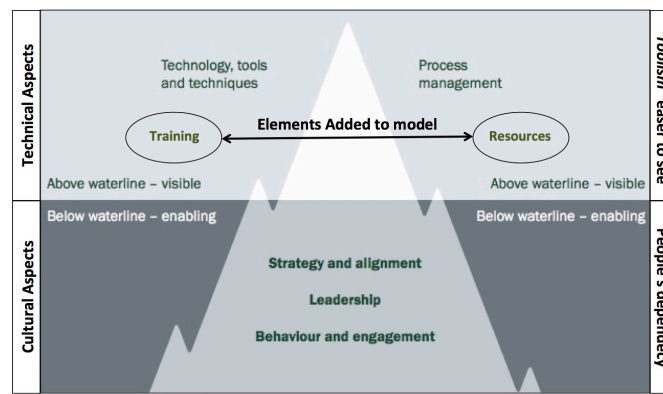

Figure 1. Lean Iceberg Model - Adapted from Hines *et al.* (2008)

Within the cultural and technical aspects, seven organizational elements, which impact the lean journey were identified. According to results from the papers reviewed (Figure 2), the concentration of lean barriers and enablers within the cultural aspects is associated with strategy and alignment elements with 27% and 31%, followed by behaviour and engagement with 24% and 18%. On the other hand, the lean barriers and enablers within the technical aspects have high concentration in processes elements with 15% and 8%, followed by training with 8% and 9%.

These findings can be connected to the iceberg model and the "*toolism*" tendency, as the majority of barriers and enablers identified are below the waterline. This represents relevant intangible barriers and enablers related to cultural aspects with people's dependency. This situation is more difficult to deal and overcome, mainly because is something that cannot be easily seen. Regardless of the concentration of barriers and enablers in cultural aspects, all elements are relevant and there is no weak one. It is important to highlight that training and resources that were added to the original iceberg model, have presented important participation in terms o barriers and enablers classification.

In terms of manufacturing and services area, the analysis revealed that 56% of the barriers and enablers come from the manufacturing area, where lean was first implemented. The services area represents 44% of the barriers and enablers encountered.
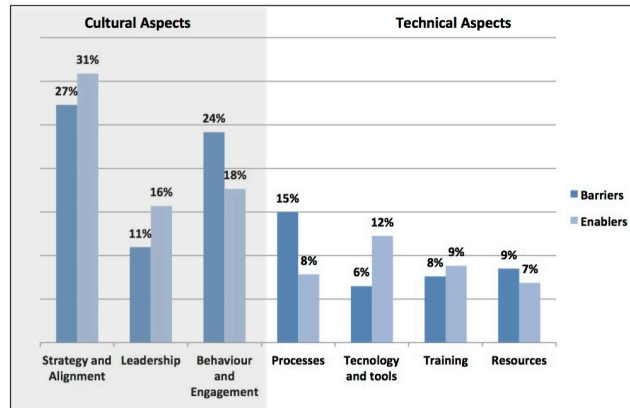
Figure 2 – Frequency From Literature for Each Type of Barriers and Enablers

The figure 3 shows that barriers and enablers to implement lean in services come from different areas and some of them are predominant, such as healthcare and public sector. The healthcare area with 41% was identified with the majority of the barriers within the services sector.
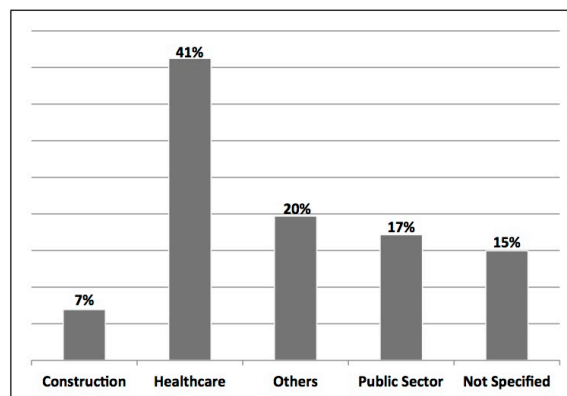

Figure 3 –Enablers and Barriers in the Services Areas

The public sector with 17% has also identified a considerable number of barriers and enablers to implement and sustain lean (Radnor and Boaden, 2008; Radnor, 2010a). Some of the papers were related to other services areas, or were not specified by the authors.

CLOSING REMARKS

The lean philosophy had become popular across the lean in manufacturing and service areas and its benefits are immense. Paradoxically the success rates of lean implementation are significantly low, nearly two- thirds of the lean implementations results in failures and less than one-fifth of those implemented have sustained results (Bhasin and Bucher, 2006). This issue might be associated to some hurdles faced during the lean journey, but also the lack of some enablers. Bhasin (2012b) argues that lean is unique and is imprudent to replicate another organizations model, thus, to be adopted successfully, lean must be adapted to its context, it is vital to understand that lean is a context dependent (Bateman *et al.,* 2014; Radnor and Osborne,

2012). Thus, understand the barriers and enablers in the organizational context becomes crucial to increase the success rates of lean initiatives.

This paper addressed the organizational classification of lean barriers and enablers in cultural and technical aspects. These barriers and enablers constraint or support the philosophy to became a strong process improvement technique across the organization. In order to provide a suitable understanding about these barriers and enablers, they were classified in seven organizational elements in terms of cultural and technical aspects, using an adaptation of the "lean iceberg model" first developed by Hines *et al.* (2008). The three cultural aspects are behaviour and engagement, strategy and alignment and leadership, and the four technical aspects are training, resources, process and technology and tools (Table 1).

According to Hines *et al.* (2008) the elements in the iceberg model are all interdependent, thereby addressing all of these elements is essential in order to deliver a successful, sustainable lean transformation. Whilst adding the two new elements training and resources generated a comprehensive model, tackling different enablers as well as barriers to implement lean.

The barriers and enablers related to cultural aspects have demonstrated to be the most influential during the lean journey, organizational elements, such as strategy and alignment followed by behaviour and engagement have a relevant function during the lean journey. These aspects are related to people's dependency and are more difficult to be identified and overcame. On the other hand, the technical aspects follow the "*toolism*" trend, where it is easier to identify and tackle problems related to process, tools, training and resources.

Within the literature in most of the cases there is no clear separation from barriers and enablers in lean implementation, some authors address both simultaneously in their papers (Eswaramoorthi *et al.,* 2011; Aij *et al.,* 2013). However the logical explanation for this situation relies in the relationship of these two elements. One is pointed as cause of problems (barriers) and the other (enablers) is indicated as countermeasure in terms of how to overcome these hurdles. This emerges in a logical way, for example, the lack of training is a barrier, and thereby providing an effective training program is an enabler to implement lean.

The understanding of organizational barriers and enablers to implement lean in different areas, might contribute to increase success rates about lean implementation and sustainability. Moreover, for companies that are embarking in a lean journey, this can work as "lessons learned" and will avoid or at least ease the hurdles faced by other companies during the lean journey.

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