



Barriers to effectively implementing continuous improvement in Spanish firms

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Abstract:	<p>The aim of this paper is to propose a classification of the barriers of continuous improvement and identify the different profiles of companies based on it. First, a literature review was done in order to identify the main barriers; second, some of them were included in a survey based on experts' opinions; third, a survey was conducted among people responsible for implementing continuous improvement; and finally factorial and cluster analysis were applied. Based on the results, two main factors were identified: "pre-implementation barriers" and "during implementation barriers". Additionally, four clusters were analysed "informal companies", "disoriented companies", "unaware companies" and "slightly-hindered companies". As many companies still struggle when implementing continuous improvement, the results of this study can help all them to focus on the most important aspects in order to guarantee the sustainability of the continuous improvement system. From a theoretical point of view, this work contributes to the continuous improvement field by analysing the nature of the main barriers companies can find when implementing these initiatives. Thus, not only does this study provide a hierarchy of the most important barriers, but also classifies them. As far as authors are concerned, this is the first attempt to categorise continuous improvement barriers.</p>

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Cluster analysis

Subject classification codes: include these here if the journal requires them

INTRODUCTION

The concept of continuous improvement, understood as synonymous with Kaizen, is not a new philosophy. In fact, the concept dates back to the eighties. At that time, Imai (1986) defined continuous improvement as the progressive improvement that involves everyone, including both managers and workers.

Although initially applied to the manufacturing industry, nowadays more and more companies, regardless of their size or sector, have decided to adopt this management

philosophy either individually or as part of a broader management system such as Lean Management or Total Quality Management (McLean et al., 2017).

Continuous improvement has also received a lot of attention in the academic world. There is a wide variety of studies that have addressed this issue from different perspectives, as evidenced by the reviews published on the subject (Álvarez-García et al., 2018; Sanchez and Blanco, 2014, 2016). However, despite its maturity, recent research indicates a rebound in the number of publications in this regard (Álvarez-García et al., 2018; Carnerud et al., 2018), what could be understood as an attempt to respond to the unknowns which, even today, companies face when they decide to implement continuous improvement. In fact, there are several studies that conclude that there are still many companies that encounter difficulties in guaranteeing the sustainability of the system, even failing (Bessant et al., 2001; Carnerud et al., 2018; Jorgensen et al., 2003; Lillrank et al., 2001; Raj and Attri, 2010).

For all of the above, it is important to deepen the study of the factors that hinder the implementation of continuous improvement. While it is true that this issue has already been worked on in the literature, it is striking that the vast majority of studies are descriptive. That is, most of them are limited to analysing the specific case of one or several companies, and to identifying/explaining the aspects that enabled the implementation. Therefore, as far as authors are concerned, no studies have been found that go one step further and analyse the nature of these barriers; hence, the relevance of this study is derived.

Therefore, the objective of this study is to analyse the nature of the barriers of continuous improvement, proposing a classification of them and identifying the different profiles of companies based on them.

To achieve the aforementioned objective, and based on the data collected through a survey among those people responsible for the implementation of a continuous improvement system, multivariate techniques such as factor analysis and cluster analysis have been used. Although this methodology is commonly applied in the field of business administration, little research applies it to the specific field of continuous improvement. The work of Jurburg et al. (2018) analyses the level of implementation in manufacturing companies of 16 CI routines and its effect on employee participation. In no case have identified studies proposed a classification of continuous improvement barriers, using this or another analysis methodology. Thus, it is at this point where this work makes its greatest contribution.

The rest of the paper is structured as follows. In the second section, the concept of continuous improvement is analysed in greater depth so that, immediately after, a review of the literature related to the barriers of continuous improvement is included. Later, in the third section, we describe the empirical study carried out with reference to the design of the empirical study and the sample which we worked with. The fourth section contains the main results of the factorial and cluster analysis. This work ends with the discussion and conclusions section.

CONTINUOUS IMPROVEMENT BARRIERS

In order to respond to the above-mentioned objective, firstly, a literature review was carried out in the main international databases (Web of Science and Scopus). By way of summary, table 1 lists the main barriers identified in the academic literature (they are listed alphabetically by the first author's last name). Specifically, 24 different obstacles have been identified in 27 research papers.

Among the works found, those that identify and analyze a greater number of barriers are those of Albors Garrigós et al. (2009), Bateman and Rich (2003), Jun, Cai and Peterson (2004) and Suárez Barraza et al. (2011) with a total of 13, 10, 9 and 9 barriers respectively. On the other hand, among the barriers identified, the most repeated ones are: lack of management commitment, lack of staff involvement, lack of resources, resistance to change (Employees) and lack of training on CI topics.

Anyway, along the review, the authors have not identified any study that analyses the different types of facilitators applying methodologies such as factor analysis.

INSERT TABLE 1 AROUND HERE

EMPIRICAL STUDY

Stage 1: Survey design

In order to identify the barriers that should be included in the final survey, the process proposed by Martini et al. (2012) was followed:

- Problem formulation: a gap was pinpointed: the lack of studies which analyse the different typologies of continuous improvement barriers.
- Theory building: a literature review was done and experts were asked;
- Research design: companies that had practised continuous improvement were surveyed;
- Problem solving: factorial and cluster analysis are done in order to find a classification

After identifying the barriers (Table 1), the selection and validation of the items (from a content perspective) was done by a panel of experts, a technique that has been traditionally used in the management field (García-Ruiz and Lena-Acebo, 2018). Therefore, eight experts were contacted: 3 academics and 5 practitioners. Among the academics there were Full Professors and Senior Researchers of the Business and Management field that, at the time of this research, had authored around 47 papers related to CI (29 of which were published in high impact journals (SSCI or SCI)). On the other side, the practitioners were high managers, quality managers or consultants with more than 10 years of experience developing CI initiatives in different service and manufacturing sectors. The inclusion of academics and practitioners was aimed at obtaining a good balance between theory and practise.

First, in-depth interviews were carried out with the experts. They had to evaluate whether the items included in the construct were appropriate. All the changes they proposed were included in the construct and, after that, the new construct was analysed by all of them again. This process was repeated until they all agreed with the content of the construct. The process lasted for a year (2011-2012). Finally, 14 barriers were selected (Table 2).

INSERT TABLE 2 AROUND HERE

Stage 2: Sample and information caption

In order to identify our final population, first, all companies from Cantabria with more than 20 employees (808) were asked whether they practised continuous improvement or not. The minimum number of employees was set because, on the basis of our experience, the smallest firms do not usually develop CI. In fact, according to the obtained results, nearly 80% of the biggest firms (200-499 employees) practise CI, whereas only 18% of

the smallest companies (20-49 employees) implemented CI. Thus, our first impression was confirmed.

Finally, 209 companies responded affirmatively (37% response rate). These firms were sent a second survey. Regarding the barriers, firms were asked to rank whether the 14 barriers had been important for them or not. In order to do so a five-point Likert scale was proposed (1 – it was an unimportant barrier- to 5- it was a very important barrier).

In this case, 109 responses were received (52.15% response rate). As Albors and Hervás (2007) highlighted the lack of a national database of firms practising CI makes it difficult to assess the representativeness of the sample.

RESULTS

Descriptive analysis

Before conducting the factorial analysis, a descriptive analysis of the barriers which companies found when implementing continuous improvement is included. Table 3 shows mean scores, standard deviations, and the percentage of firms for which each barrier is unimportant or important.

INSERT TABLE 3 AROUND HERE

As it might be seen from table 3, lack of time (3.41), lack of knowledge and experience about continuous improvement (2.88) and resistance to change (2.82) are the most important barriers. However, on the other side, lack of management commitment (1.59), not learning from mistakes (2.06 and lack of integration between continuous improvement aims and company competitive strategy (2.19) are the least important ones.

Factorial analysis

In order to group the different identified enablers in barriers, a “Principal Components Factor Analysis” with varimax rotation was conducted. That replaces the 14 barriers included in the survey with as little loss of information as possible, allowing us to analyse the structure of the barriers that facilitated surveyed companies to implement CI.

First of all, communalities were checked. The items “lack of time”, “lack of employees motivation”, “lack of resources” and “the project is not profitable” were eliminated because their communalities were lower than 0.5. The Cronbach alpha obtained for the 9 remaining items is 0.89, indicating an appropriate degree of internal consistency of the measurement scale.

Based on the criterion of percentage of variance, two factors can be distinguished: (1) Pre-implementation barriers; and (2) During implementation barriers. These account for 60.09% of the total variance (Table 4).

INSERT TABLE 4 AROUND HERE

Furthermore, in all cases, the factor loadings of the items are acceptable (greater than 0.4). Bartlett’s sphericity test allows us to reject the null hypothesis that states that the variables are uncorrelated; the test value is high and is associated with a significance value below 0.05. Meanwhile, the Kaiser-Meyer-Olkin (KMO) in our case is 0.880, indicating the suitability of the analysis.

Additionally, the reliability analysis provide a Cronbach alpha of 0.813 for factor 1 and 0.759 for factor 2, indicating that all items should be considered for the construction of these factors.

The interpretations of the factors that summarise the facilitators are as follows:

- Factor 1: “Pre-implementation barriers”: This factor includes items such as “Ambiguity with the company objectives”, “lack of a suitable measurement

system”, “lack of knowledge and experience about continuous improvement”, “lack of management commitment” and “lack of integration between continuous improvement aims and company competitive strategy”.

- Factor 2: “During-implementation barriers”, which is made up of four items “not learning from mistakes”, “resistance to change (employees, unions)”, “proposed improvements are not monitored” and “lack of a formal process to resolve problems”.

Cluster analysis

As a complement to the previous factorial analysis, a cluster analysis has been developed with the objective of determining whether there are common behaviours that allow distinguishing different types of companies. To carry out this analysis, and given the lack of previous studies of this type in the field of continuous improvement that serve as a starting point, in this work we have used the dendrogram and the agglomeration coefficient (Gómez-López et al., 2016, 2017). Thus, in Table 5, it is observed that the biggest difference between the percentages of change is given in the 4 clusters (5.75), then that will be the number of groups that will be taken to complete the analysis.

INSERT TABLE 5 AROUND HERE

According to the results presented in table 6, pre-implementation barriers are more important for clusters 2 and 4; whereas during-implementation barriers are more important for clusters 1 and 3.

INSERT TABLE 6 AROUND HERE

Based on the above information, and analysing in greater depth the differences detected between the 4 proposed groups, it is intended to characterize each of the defined

clusters in greater detail, always from the perspective of the CI barriers. In order to do it, the average scores that each of the groups has given to each of the 9 original variables will be used.

The first defined cluster (Informal companies), composed of 29 companies, is a group affected by both pre-implementation and during-implementation barriers. In particular, the barriers most valued by this group are “resistance to change (employees, unions)”, “Lack of knowledge and experience about continuous improvement”, “Lack of a formal process to resolve problems” and “Lack of a suitable measurement system”. It could be said that this group of companies, probably due to their lack of experience, lacks a formal process to implement continuous improvement, which undoubtedly implies an increase in internal resistance to change among workforce. Thus, the fact of not having an adequate measurement system prevents the company from making the right decisions since, if the problematic indicators are unknown, it is nearly impossible to decide which aspects of the company should be improved. In the same way, if a problem can be identified but the method to be followed is not defined, the disorganization will make it difficult to act in the proper way. All of the above generates a sense of improvisation that is likely to be affecting the attitude of the staff.

The second cluster (Disoriented companies), made up of 15 firms, is mainly influenced by pre-implementation barriers. Thus, it gives greater weight to “Lack of knowledge and experience about continuous improvement”, “Ambiguity with the company objectives” and “Lack of a suitable measurement system”. The companies of this second group seem to be disoriented and, in addition to their lack of experience, they do not have clear objectives. Obviously, the ambiguity of the objectives is clearly influenced by the lack of a measurement system. This, as happened with the previous

cluster, makes continuous improvement very difficult. It is complicated to establish the steps to follow if the goal is unclear.

The 19 companies that make up the third cluster (Unaware companies) are characterized because they value during-implementation barriers as the most important ones. In particular, it seems that these companies have not embraced the continuous improvement culture; they have a high resistance to change, they do not monitor improvements and they do not learn from their own mistakes. This clearly contradicts the PDCA cycle based on the establishment of objectives, the development of improvement activities, the analysis of the results obtained and, based on this analysis, the setting of new objectives.

Finally, the fourth cluster (Slightly-hindered companies), made up of 45 companies, is characterized for being the cluster with the lowest valuations in all the items. In fact, its valuation is zero in three of the nine items. Therefore, it could be said that this group of companies have hardly encountered difficulties when implementing continuous improvement. However, although with low valuations, the barriers that affected them the most were “Lack of a suitable measurement system”, “Lack of knowledge and experience about continuous improvement” and “Resistance to change (employees, unions)”.

DISCUSSION

From the theoretical point of view, this research delves into the field of barriers of continuous improvement. From the review of the existing literature, it was seen that there were no studies that, applying factor analysis or other similar methodologies, analyse in detail the nature of the CI barriers. In the literature, descriptive studies predominated, usually with small samples or even from a single company, which analysed the obstacles

that applied in their cases. Taking into account that there are still companies that find it difficult to implement CI (Maarof and Mahmud, 2016; McLean and Antony, 2017), a study of these characteristics was necessary to understand the nature of the barriers.

As a first step, the descriptive analysis of the facilitators showed that the most important ones according to the companies surveyed were: lack of time, lack of knowledge and experience about continuous improvement and resistance to change.

After the first descriptive approach, the factorial analysis was carried out. The results of the same point to the existence of two groups/factors of barriers: pre-implementation barriers and during implementation barriers. The absence of similar studies that grouped the facilitators makes comparing the results difficult. However, the classification obtained seems coherent since there would be two key moments in order to implement CI: the first one, at the time of deciding to implement it; and the second, the implementation itself.

With regard to the cluster analysis, four groups of companies have been identified. The first big difference among the clusters is that while Clusters 1 (informal companies), 2 (disoriented companies) and 3 (Unaware companies) were highly affected by the proposed barriers, Cluster 4 was scarcely affected.

It is true, however, that the way Cluster 1, 2 and 3 were affected was completely different. Thus, pre-implementation barriers mainly affected Cluster 2; during-implementation barriers mainly influenced Cluster 3; and a mixture of both factors influenced Cluster 3.

Based on the results of the cluster analysis, several conclusions need to be highlighted as they might be very useful for companies that want to implement continuous improvement in the future. To begin with, although to a different degree, all the clusters point to internal resistance as one of the most important barriers. This result is consistent

with the conclusions of previous studies that highlight the crucial role that human resources play in continuous improvement (Beheshti and Lollar, 2003; Bhuiyan et al., 2006; Garcia-Sabater and Marin-Garcia, 2009; Warwood, S.J.; Roberts, 2004). The sustainability of the system is not possible without the collaboration of the staff.

Another important conclusion is that for a system of continuous improvement to be successful, the company must know the starting point in which it is located and the objective it wants to reach (Dale et al., 1997). This implies that the company must have an adequate measurement system that allows it to know its current operation and the areas that need to be improved (Marin-Garcia et al., 2012). It is highly probable that improvements are needed in several areas of the company, and, here again, the measurement system acquires vital importance. Knowing the current performance figures will allow prioritizing the actions to be carried out and establishing objectives coherent with the company's competitive strategy (Kaye and Anderson, 1999).

Finally yet importantly, clear procedures must be established to allow improvement actions to be carried out and also to monitor them (Middel et al., 2007). Continuous improvement should not be improvised, it is a management philosophy, a structured work system, it is not an informal process. In addition, when it comes to monitoring, you must have an open mind that allows you to learn from mistakes and adjust the objectives, upwards or downwards, depending on the results obtained from the improvements (Kaye and Anderson, 1999; Marin-Garcia et al., 2012). Thus, the cycle would start again. This is, by definition, the process of continuous improvement, a constant process.

CONCLUSION

The objective of this study is to analyse the nature of the barriers of continuous

improvement, proposing a classification of them and identifying the different profiles of the companies based on them. To achieve this, a literature review and an expert consultation were carried out, which concluded with the identification of thirteen barriers. Subsequently, the factor analysis carried out was based on only nine of them, since four had to be eliminated because they had very low communality values. From there, applying factor analysis, two groups of facilitators were identified: "pre-implementation barriers" and "during implementation barriers". Finally, the analysis was complemented by a cluster analysis that allowed to analyse in greater depth the profile of the companies based on the facilitators that they detected when implementing CI. Four different groupings of companies were identified.

In the opinion of the authors, the main theoretical contribution of this work is the study of the types of barriers of continuous improvement, an analysis that had not been carried out until now and that represents an advance in this field of research. In addition, we also consider that the study is of interest to practitioners since not only does it provide a hierarchy of the most important barriers, but also classifies them. This information, combined with the profiles identified from the cluster analysis, can help all those companies that are implementing or going to implement the CI to focus on the most important aspects in order to guarantee the sustainability of the continuous improvement system.

Of course, the authors are aware that the work presents a limitation, and it is the scope of the sample used, which is focused on a Spanish region, Cantabria. While it is true that this aspect should be improved, and in fact, is proposed as a future line, given the size of the sample (109 companies), the results have to be taken into account, although with caution and without intending to make a generalization of them. . Therefore, it would not only be interesting to increase the size of the sample but also its scope.

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3 Additionally, as a future research line, the possibility of analysing whether the
4 companies reach a higher or lower level of development when implementing the CI,
5 depending on the profile to which they belong and how the barriers have influenced them.
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7 For this, we intend to cross the cluster data of this study with the level of development
8 achieved, measured through the scale of Bessant et al. (2001). This study would be of
9 interest in order to analyse which profiles are more successful.
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Table 1. List of barriers based on the literature review (Part I)

	Lack of time	Lack of knowledge about CI	Lack of experience about CI	Insufficient measures	Lack of management commitment	Lack of staff involvement	Proposed improvements are not monitored	Lack of resources	Resistance to change (employees)	Resistance to change (union)	Lack of profitability of the project	Lack of integration between CI aims and company competitive strategy	Not learning from mistakes	Lack of measures or incorrect measures	Lack of alignment between the competitive strategy and the operational activities	Lack of training on CI topics	Lack of information or incorrect analysis of the information	Ambiguity (it is not understood why the change is needed)	Lack of a formal process to solve problems	Inappropriate structure	Lack of motivation	Internal power struggles	High average age of managers and/or employees	Interdepartmental barriers
Albors Garrigós et al. (2009)	X	X		X		X		X					X			X	X	X						
Bateman and Rich (2003)	X		X		X	X	X	X	X					X		X	X	X	X	X				
Bessant et al. (1994)					X		X				X			X		X			X	X				
Bhuiyan et al. (2006)						X																		
Corbett and Angell (2011)					X			X						X					X		X			
Dale et al. (1997)			X		X			X	X								X		X					
de Jager et al. (2004)								X	X							X	X							
De Leede and Kees Looise (1999)						X																		
García-Sabater and Marín-García (2009)	X								X														X	
García-Sabater et al. (2012)				X		X			X					X		X					X			X
Heras-Saizarbitoria et al. (2011)					X	X		X	X						X	X					X			
Jaca et al. (2010)					X	X	X	X	X	X	X													
Jorgensen et al. (2003)					X																			

Source: The authors

Table 1. List of barriers based on the literature review (Part II)

	Lack of time	Lack of knowledge about CI	Lack of experience about CI	Insufficient measures	Lack of management commitment	Lack of staff involvement	Proposed improvements are not monitored	Lack of resources	Resistance to change (employees)	Resistance to change (union)	Lack of profitability of the project	Lack of integration between CI aims and company competitive strategy	Not learning from mistakes	Lack of measures or incorrect measures	Lack of alignment between the competitive strategy and the operational activities	Lack of training on CI topics	Lack of information or incorrect analysis of the information	Ambiguity (it is not understood why the change is needed)	Lack of a formal process to solve problems	Inappropriate structure	Lack of motivation	Internal power struggles	High average age of managers and/or employees	Interdepartmental barriers
Jun et al. (2004)	X				X	X		X	X					X	X	X								X
Kaye and Anderson (1999)		X				X						X	X	X										
Lodgaard et al. (2016)		X			X	X																		
Marsh (2000)													X			X								
Middel et al. (2007)	X	X	X	X														X						
Mohammad Mosadeghrad (2014)					X	X										X			X	X	X			
Rapp and Eklund (2002)									X															
Schroeder and Robinson (1991)													X											
Sillince et al. (1996)		X						X																
Suárez-Barraza and Ramis-Pujol (2008)		X			X	X												X				X		X
Suárez-Barraza et al. (2011)	X				X		X	X	X	X	X	X			X						X			
Tatikonda and Tatikonda (1996)															x									
Upton (1996)						X			X									x						
Walker (1992)		X						X																

Source: The authors

Table 2. Final selection of barriers included in the survey

Barrier_1	Lack of time
Barrier_2	Lack of knowledge and experience about continuous improvement
Barrier_3	Ambiguity with the company objectives
Barrier_4	Lack of a suitable measurement system
Barrier_5	Lack of management commitment
Barrier_6	Lack of employees motivation
Barrier_7	Proposed improvements are not monitored
Barrier_8	Lack of resources
Barrier_9	Resistance to change (employees, unions)
Barrier_10	The project is not profitable
Barrier_11	Lack of integration between continuous improvement aims and company competitive strategy
Barrier_12	Not learning from mistakes
Barrier_13	Lack of a formal process to resolve problems
Barrier_14	Others (indicate)

Source: Authors

Table 3. Barriers to implement continuous improvement

	Mean	Standard deviation	Unimportant (Score from 1 to 3) % firms	Very important (Score from 4 to 5) % firms
Lack of time	3.41	1.261	47.7	52.3
Lack of knowledge and experience about continuous improvement	2.88	1.108	68.8	31.2
Ambiguity with the company objectives	2.41	1.077	82.6	17.4
Lack of a suitable measurement system	2.70	1.162	72.5	27.5
Lack of management commitment	1.59	0.886	94.5	5.5
Lack of employees motivation	2.20	1.125	85.3	14.7
Proposed improvements are not monitored	2.31	1.063	87.2	12.8
Lack of resources	2.30	1.277	78	22.0
Resistance to change (employees, unions)	2.82	1.259	66.1	33.9
The project is not profitable	2.20	1.109	89.9	10.1
Lack of integration between continuous improvement aims and company competitive strategy	2.19	1.054	89	11.0
Not learning from mistakes	2.06	1.118	85.3	14.7
Lack of a formal process to resolve problems	2.34	1.216	80.6	19.4

Source: Authors

Table 4. Rotated matrix of barriers

	Factors	
	Pre- implement ation barriers	During implement ation barriers
Ambiguity with the company objectives	0.817	0.178
Lack of a suitable measurement system	0.775	0.148
Lack of knowledge and experience about continuous improvement	0.761	0.142
Lack of management commitment	0.610	0.383
Lack of integration between continuous improvement aims and company competitive strategy	0.541	0.522
Not learning from mistakes	0.102	0.809
Resistance to change (employees, unions)	0.105	0.744
Proposed improvements are not monitored	0.408	0.648
Lack of a formal process to resolve problems	0.501	0.581

Extraction method: Main components analysis. Rotation method: Varimax standardization with Kaiser.
a. The rotation has converged in 6 iterations.

Table 5. Agglomeration coefficient of the barriers to implement CI

Number of groups	Coefficient Agglomeration	Percentage change of coefficient	Differences between the percentage changes
8	61,00	104,10	-43,32
7	124,50	60,78	-22,89
6	200,17	37,89	-9,05
5	276,00	28,83	-3,03
4	355,58	25,80	5,75
3	447,33	31,56	-0,79
2	588,50	30,77	
1	769,56		

Table 6. Factor average and statistical tests verifying the difference

	Informal companies	Disoriented companies	Unaware companies	Slightly hindered companies	Kruskal Wallis	
	N = 29	N = 15	N= 19	N = 45	Chi-squared	Sig.
Pre-implementation barriers	3.07	3.212	2.044	1.742	72.434	0.000
During implementation barriers	3.19	2.3	3.065	1.6	80.83	0.000

Source: authors