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Continuous Improvement Programs and the key elements characterizing their Sustainability, a first attempt

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Résumé - La pérennisation des démarches d'amélioration continue (DAC) est caractérisée par un ensemble d'éléments qui peuvent se trouver à différents niveaux de l'organisation (stratégique, tactique ou opérationnel) et qui peuvent être influencés par des facteurs internes ou externes à l'entreprise. Nous avons analysé la littérature concernant l'Amélioration Continue (AC) et nous avons sélectionné quinze de ces éléments. Une de leurs caractéristiques est la proximité avec la nature changeante des processus d'AC, mais aussi le fait qu'ils peuvent être considérés comme de possibles facilitateurs de stabilité. L'objectif de cet article est de montrer comment nous avons été en mesure de corroborer leur existence dans un contexte industriel et d'évaluer leur impact sur la pérennisation des DAC. A cette fin, nous avons élaboré un questionnaire d'autoévaluation, destiné aux industriels et responsables d'AC. Les résultats obtenus prennent en considération l'impact tangible des éléments clefs et les différentes visions de la pérennisation. En se basant sur ces résultats, d'autres recherches seront proposées, comme par exemple, la relation entre les éléments et leur impact sur la pérennisation des DAC. Ces recherches permettront d'approfondir nos connaissances sur les éléments clefs du processus de pérennisation des DAC et d'anticiper d'éventuels risques à l'essoufflement de la dynamique des DAC.

Abstract – The sustainability of Continuous Improvement Programs (CIP) is characterized by a set of elements that originate from internal or external factors. They can be found in different levels of an organization; either strategic, tactical or operational. We have studied the literature regarding Continuous Improvement (CI) and then selected a total of fifteen elements. One of their characteristics is the closeness they have with the changing spirit of CIP, but also the fact that they can be studied as potential stability triggers. The purpose of this paper is to corroborate the existence of these elements within a real business environment and evaluate their impact on CIP sustainability. In order to achieve that, we have designed a self-assessment survey targeted to manufacturers and CI leaders. The results were related not only to actual element impact, but also to the different visions of sustainability. Based on these results, further research is suggested, for example study of the relationship between key elements and how their impact can be a reflection of CIP knowledge. This research will allow us to deepen our knowledge on key elements that characterize the sustainability of CIP and to anticipate possible risks to the weakening of dynamics of CIP.

***Mots clés* - Pérennisation, Amélioration Continue, Éléments Clefs**
***Keywords* –Sustainability, Continuous Improvement, Key Elements**

1 INTRODUCTION

Continuous Improvement (CI) is a philosophy conceived to systematically reduce waste (e.g. Lean Manufacturing, Lean Management) [Boyle *et al*., 2014] while increasing the quality of the products created or services offered, ensuring best practices [Moen, 2009], and innovating in every aspect of the organization in order to achieve excellence [Bessant *et al.,* 1994]. This type of approach is based on strategic developments of organizational capabilities that can occur through an evolutionary process [Bessant *et al*., 2001], or by radical changes [Bhuiyan and Baghel, 2005].

CI endeavors not only focus on products but on the processes linked to them [Moen, 2009]. According to Deming [1986], the initiatives to institutionalize CI within the organization are more complex than we think, mainly because we need to focus on processes, which are more susceptible to environmental changes. Following the same idea of continuous changing, one feature of continuous improvements programs (CIP) is the Plan-Do-Check-Act (PDCA) cycle, also known as the Deming circle [Moen, 2009], where the adoption of changes (over the Act stage) are the last actions in order to restart an improvement progression.

CI has since been proven to deliver benefits, therefore, it is very tempting to prematurely declare victory with initiatives that have attained most of their objectives [Mitchell, 2015]. Unfortunately, most of them end in failure [Keating *et al.,* 1999], despite the fact that they are an essential element of operational excellence [Mitchell, 2015].

Companies have encountered difficulties reaching sustainability, even in their early stages. Sustaining a successful improvement program is not an easy undertaking, for several reasons. Firstly, some enterprises have focused on performance objectives without assuring that the procedures necessary to

attain the improvements should be sustained in the long term [Mitchell, 2015].
Additionally, companies must manage different factors simultaneously, which have different scopes with different evaluation and control systems, creating a complex and delicate environment [Marin and Varoni, 2016]. Lastly, there is a lack of research [Shediac-Rizkallah and Bone, 1998] regarding the definition of sustainability, therefore there is no clear definition that could be translated into a CI framework.

From previous works, we determined our own understanding of the term sustainability by studying a series of interpretations from different research fields: *semantics, environmental, financial, health* and *industrial*; highlighting their features in order to achieve a definition closer to a business setting, particularly to continuous improvement endeavors. In the case of *semantics* (by the use of dictionaries and encyclopedias), sustainability is perceived as "*an action that last long or a long time*" (Larousse, 2015), where the sense of temporality and transiency is present, guiding us to believe that sustainability is not an immobile characteristic but an "action" that is in continuous motion. Regarding the *environmental* approach, the sense of the sustainability definition leans toward an ecological perspective; in the words of Nelson *et al.,* it is the act of the *"restructuring of human population on Earth around a core awareness that the natural resources upon which it depends for survival are limited, perishable and renewable only within narrow and delicate parameters"* (Nelson *et al.,* 2012, p.71). In this field specifically, resource management is taken into account, which can be easily translated into a business framework.

Within a *financial* spectrum, sustainability has very different meaning, both from a *capacity* (Bamberger *et al.,* 1990) and financial *benefits* (Shediac-Rizkallah & Bone, 1998) points of view. In each case, sustainability is reached by the investment of certain resources in order to obtain profits; that is, a conscious strategy to achieve the set objectives, and just as is the case for the environmental aspect, this interpretation can be used in our own definition. From a *Health* point of view, sustainability is directly linked with equilibrium, processes (Cornillot, 2005) and maintenance (Decroix *et al.,* 2005).

Finally, in the exercise already carried out, we have studied sustainability definition from an *Industrial* perceptive, in this case it is described as "*the ability of an enterprise, its products and its system to remain competitive and productive long-term, without failure, while minimizing waste; by adopting a strategy with an established performance requirement in the most effective and efficient manner possible over the entity's life cycle*" (Mathaisel *et al.,* 2009, p.11). Here, we are dealing with a closer description of the interpretation we are trying to achieve. Unfortunately, it does not completely suit our needs, therefore it is necessary to add the features previously studied from other research fields.

After doing that exercise, we have defined sustainability (Chirinos *et al.,* 2017) as:

"*The capacity to maintain a gradually level over time, associated with a performance, project, program*
- *according to well-defined process*
- *with limited and finite resources*

with the particularity of being able to adapt itself to context evolution, which can be easily translated into a company environment where it is one of the top priorities of any level of the organization"

Since sustainability is being perceived as the result of a constant adaptation [Benghozi, 2009], we can introduce the premise that the sustainability of CIP thrives within a two-state dynamic, one stable and the other fluctuant, and that this cycle is characterized by a set of elements disseminated throughout the organization. Therefore, a set of questions are generated; what are the elements that can influence the sustainability of CIP? What is the impact of those elements over the sustainability of CIP?

The objective of this article is not only to: identify these elements, validate their existence within the work field, study the impact they have over the sustainability of CIP, but also to compare the element impact based on knowledge, specifically the knowledge of sustainability.

The present article is organized as follows: in section two, we present the approach given to the research with the identification of 15 elements that characterize CIP sustainability, and a brief explanation of self-assessment survey, which has been designed to assess and analyze such element impact. In section three, we present the results obtained from a literature review regarding the 15 elements which are linked with CI theories; and the study of their main features, the way they can affect CIP. In section four, we present the results of the self-assessment survey, its analysis, conclusions, and ideas to exploit as further research.

Section five is dedicated to discussion in which we endeavor to present opposing points of view regarding the results of our literature findings and the survey results. Finally, section six is dedicated to the conclusion and suggested further research.

2 APPROACH

The identification of the elements is based on a literature review. In a non – exhaustive manner, we identified 15 elements: tools and methods for CI, organizational routines, communication management, resources, change management, knowledge management, risk management, time management, training on methodologies and tools for CI, diagnosis, decision-making, employee engagement, leadership, organizational culture and performance of CI initiatives. Each of which has different characteristics and features, but with a common trait: they seem to have a degree of influence over the sustainability of CIP.
On the other hand, and with the objective to measure the impact of the element, we have designed a self-assessment survey composed of 22 questions. This survey was handed-out during a master-class given to manufacturers and CI leaders. The master-class was entitled, "Complexity, uncertainty and sustainability of CI initiatives", held by the ECAM (École catholique des arts et métiers) in the city of Lyon, France.

In this activity we explained how the interpretations of the CI have evolved along with the needs of the industry and the importance of sustainability as a long-term goal from the organization. We also demonstrated that our interpretation of sustainability as a dynamic body, when tied up with CI efforts, can be influenced by a set of key elements. We questioned the possible inner relationships and the potential that exists in their study in order to avoid possible degradation in CI performance.

The master class held 45 people, coming from a variety of business fields: aeronautics, consultancy firms, automotive

industry, heavy industry, plastics, construction and others. Their functions could be described, organizationally, as medium to a high positioning: Project Managers, Quality Managers, CI Advisers, CI Supervisors, Plant Managers, Productions Managers, and General Directors.

In this survey, we measured the degree of impact from the element, by defining four different levels: *no impact, low impact, moderate impact and significant impact*. We also introduced two other questions of high relevance, such as the knowledge level of CI initiatives and the company maturity regarding CI. In both cases the evaluation scale was the same: *inexpert, beginner, confirmed and expert.*

3 Results of the literature review – Key elements characterizing CIP sustainability

As a result of the literature review we were able to identify a number of elements relevant to CI and its sustainability. This set of elements has some particular features: they are scattered throughout the business organization; they are also characterized by the fact that some of them are easier to measure than others; and they fit our initial premise of the two-state dynamic to obtain the sustainability of CIP. Finally, we briefly summarize a rank of the elements regarding their appearances within our sources (articles, journals, books, study cases, interviews, among others) (Table 1).

3.1 Tools and methods for CI

While analyzing **tools and methods for CI**, (e.g. Lean Manufacturing, Lean Six Sigma, Kaizen, etc.) we are dealing with the techniques designed to support the philosophy of CI**.** Within a company these techniques are not isolated entities, most of them are used simultaneously with others [Hines, 2010]. In order to reach the sustainability of its CIP, the selection of the most suitable tools is linked to company strategy, and the absence of these tools can lead to issues relating to the maintenance of transformation programs [Hines *et al.,* 2004]. These tools can be seen as part of the dynamic character of an organization, and is the reason why we have selected to measure their impact in the search of sustainability of CIP.

3.2 Organizational routines

Organizational routines are pivotal elements within the CI [Becker, 2004]; they are precise and predictable behaviors that standardize processes. It is an element that generates dynamism, highly linked with the performance that induces the reduction of uncertainty and works as an artefact that leverages skills by imposing knowledge transfer in an organization [Becker, 2001].

By studying the impact of organizational routines and the fact that their ongoing performance generates change in the organization [Feldman and Petland, 2003], we opted to select them for research. The routine aspect can be an extended and complex one, mainly because it takes into account different vectors [Peigné, 2013]. For instance, they can be seen as a way to foster stability but at the same time they are an ingredient of changing process. By affirming that, we assure that the routines can cover all aspects of the cycle by fitting perfectly within an evolutionary framework [Becker, 2001]; since this element can be studied from two different scopes, it suits perfectly with our premise.

3.3 Communication management

With regards to **communication management**, we define it as: the communication platforms where ideas, suggestions and problems around CI are discussed by workers at different skill levels, creating an atmosphere of trust and openness, in order to sustain their CIP. Communication has been widely recognized in the literature as a vital component of lean projects as part of the CIP [Martínez *et al*., 2014], where high levels of contact from senior and middle management to shop floor personnel created rich feedback.

Communication management in our research context becomes a true interactive process, where transmitting information regarding development generates inputs on desired improvements, and provides feedback as a basis for action and change [Oakley, 1996].

3.4 Resources

Resources are all the administrative, financial and physical structures and human capital or labor force needed to support CI initiatives. The CI highly regards the use of them, since they are the main vehicle in order to obtain the expected results [Bessant *et al.,* 2001]. This element is strongly linked with the tools and techniques used to handle those resources within a CI framework.

3.5 Change management

Change management can be studied as the way the company is able to adapt to the changes and conditions of the environment. By trying to measure the impact of this element, we examine how the need for change, as improvement, is understood, and the effort of the organization to adopt new ways to work are being taken into account. Although they can be divided in two categories, evolutionary and radical [Abdallah and Mamlouk, 2007], they are both linked with transformation, where the incertitude of upcoming results is a constant. One the main characteristics about this element is its richness, strategically wise, it can be interconnected with economic incentives, downsizing and the risk of heavy staff redundancy [Beer and Nohria, 2000].

This element is also linked with how companies face Staff resistance, how the managers need to tackle this issue in order to change the potential mind-set of suspiciousness, where changes initiated by a company will affect jobs in a negative way [Kotter and Schlesinger, 2008].

3.6 Knowledge management

Knowledge management is studied as the platforms, protocols or techniques (formal or informal) used by an organization with the objective to disseminate knowledge. We can study it as a source of innovation and an organizational capability [Nonaka *et al.,* 2000]; in this case, the use of knowledge can be seen as a self-renewal process where inputs and outputs are in a constant interaction. One of its features is the difficulty associated with measurement, since it is nearly impossible to buy or sell organizational knowledge assets [Tyagi *et al.*, 2015].

3.7 Risk management

Risk management is the cumulative effect of the probability of occurrences that may positively or negatively affect project objectives. The endeavors regarding this element are connected with analysis, evaluation and monitoring of risk in a company processes [Oliva, 2008]. In our case, the risks are associated with the sustainability of CIP, where decision making,

management techniques, and forecasts of environmental changes play important roles.

3.8 Time management

Time management can be perceived as how efficiency is being used so that resources achieve their goals. It is linked with task completion, priority establishments as well as the changes made as a result of those priorities [Training M.T.D, 2011]. Another important characteristic of time management is planning, and how rigid or flexible the organization is regarding their accomplishments [Powell, 2015].

3.9 Training on methods and tools for CI

The **training on methods and tools for CI** is embedded with all the programs launched by a company to introduce or improve the skills and knowledge of employees around CI. Although there is little scientific research regarding the way CI training should be given, we can acknowledge that is heavily focused on changing the mind-set of people [Martínez *et al.,* 2014]. The training is part of company strategies, since it has become a formal process, extended to functional and pivotal areas [Sánchez, 2012]. Training can be interpreted differently, depending upon the roles played within the organization, therefore, we believe in the importance of measuring its impact.

3.10 Diagnosis

Diagnosis is the practice of determining the nature or cause of a problem; in this case, problems associated with the sustainability of CIP. Diagnosis is heavily involved with the decision making strategies, and we can use it to highlight the strengths and weaknesses in an organization [Fazlollahtabar, 2013].

3.11 Decision-making

Decision-making deals with the identification of possible solutions to certain problems, challenges and opportunities, but is also related to business models and the environment surrounding a company [Rosca *et al.,* 1997]. Decisions are not taken by a single person nor can they have a speculative character. They have become more and more complicated since *decisions are interdependent, and the environment in which decision is set changes over time* [Karakul and Qudrat-Ullah, 2008, p.3].

3.12 Employee engagement

Employee engagement is about the dedication, commitment and passion for work and role within a company. Even though there is no uniform, clear definition of the term employee commitment [Brajer-Marczak, 2014], it is built on satisfaction and behavior, and it can be a cause or predictor of company performance, *since in their outcomes we can find employee retention, productivity, profitability, customer loyalty and most importantly safety* [Markos and Sridevi, 2010, p.92]. Its impact is of great importance to us, because it is one of the elements that is most influenced by employees. It can be studied as a state where people are emotionally and intellectually committed to a company [Bedarkar and Pandita, 2014].

3.13 Leadership

Leadership is about how a company is capable of establishing an orientation, develop a vision for the future, while setting strategies for coping with change. Leadership is about motivating, inspiring and energizing people. It is about guidance across an organization, creating open communication [Sánchez, 2012] with the objective of sustaining the CIP. Leadership is one of the defining elements in our survey, because it deals with personality, the influence over people, values, expectations and interests [Văcar and Miricescu, 2013]. Leadership has to set goals, meaning that it must create a value [Dombrowski and Mielke, 2013], in our case, it is the way middle and high levels of organizations set the tone in order to sustain CIP.

3.14 Organizational culture

The values, beliefs and practices shared by members of all groups of the organization can be defined as **organizational culture**. The culture can be linked with experience and can be the result of the company management systems [Mann, 2014]. The culture has many interpretations, layers and dimensions, especially within a company environment. But one thing is clear, the organizational culture impacts the practices and, therefore, the effectiveness of the endeavors [Bortolotti *et al.,* 2015], therefore is our reason to confirm, not only its existence, but the impact of CIP.

3.15 Performance of CI initiatives

Evaluation of the **performance of CI initiatives** is a set of tools used by an organization in order to measure results. In this article, the interpretation leans toward creating clear and understandable measurement tools capable of taking into account sustainability progress; in other words, *how to build a comprehensive system of indicators for monitoring and control of the progress towards sustainability* [Novkov and Dakov, 2007, p.187]. It is important to highlight that indicators reflect the strategies and objectives of an organization [Ketokivi and Schroeder, 2007].

Table 1. Rank of appearances in sources

	Sources	Rank
Tools and methods for CI	60	#1
Organizational routines	18	#4
Communication management	7	#12
Resources	6	#14
Change management	26	#2
Knowledge management	10	#8
Risk management	14	#7
Time management	7	#13
Training on methods and tools for CI	8	#10
Diagnosis	6	#15
Decision-making	9	#9
Employee engagement	15	#6
Leadership	20	#3
Organizational culture	8	#4
Performance of CI initiatives	17	#5

From the literature review, we counted the number of times that the elements appear in our sources (scientific journals, case studies, reviews articles, interviews, books and books reviews) and ranked them according to frequency (see Table 1). With a total of 231 sources, we observed that the highest number of appearances was the element *Tools and Methods for CI*, which totaled 60. On the opposite end of the scale, the element with the least number of appearances within our sources was *Diagnosis*. This exercise that might appear simplistic, but it is interesting because it enables us to understand a new perspective of the sustainability of CI endeavors by comparing the elements from a research perspective (that is, what is within the literature)

to the point of view of the respondents. It is important to note the totality of sources is not directly direct with the CI field, since we are trying to expand this research we are also expanding our inquiries within other research areas, e.g., management, human resources among others.

4 SELF-ASSESSMENT SURVEY RESULTS

As mentioned previously, the self–assessment survey was conducted during a master-class given to manufacturers and CI leaders. In this survey, we managed to hand out a series of questions regarding the elements that influence the sustainability of CIP.

One of the reasons we call this article a 'first attempt' is because we had a total of 41 responses. This might not appear adequate for in-depth analysis, but is sufficient to acknowledge the existence of the elements within a CI framework, measure the impact of each element over CIP sustainability and finally compare the most representative elements regarding not only their impact but the CI knowledge of the respondents.

The first variable that we measured was the knowledge of the respondents regarding CI endeavors, for example, Lean, Kaizen, WCM (World Class Manufacturing). This question was proposed with the objective of knowing our population, their degree of knowledge. The results are as thus:

- None of them consider themselves inexperienced.
- 15% of the respondents consider themselves as beginner.
- 63% confirmed.
- 22% experts.

It is important to emphasize that these responses are not directly related to maturity of the company they work in; it is only a reflection of their personal experience. Due to the number of responses, it is not possible to make further analysis within the groups, meaning that, we cannot compare beginner and confirmed or expert and confirmed and so-on, since we do not have a representative sample of the total population.

Using the same methodology, we measured the company maturity regarding it CI, giving them the same example of endeavors, Lean, Kaizen and WCM, in this case we obtained:

- 5% inexperienced.
- 59% beginners.
- 30% confirmed.
- 7% experts.

As mentioned previously, the company maturity and the respondent knowledge are not directly linked, that is, some people consider themselves as having confirmed knowledge (regarding CI) whilst working in an inexperienced company. This analysis could be useful for later studies, such as investigating how people could become transformer agents, not only to introduce but also to raise the maturity knowledge within organizations, specifically knowledge of CI. Another important topic to note is that the question regarding the knowledge of the company was made as a global one-we did not ask about specific assembly lines, or department or service, we treated the company as a complete unit.

Regarding the elements and their impact over the sustainability of CIP, we wanted to test firstly, the existence of the elements within an organization, that is, we aspired to study the coherence between the literature and the actual shop floor; secondly, list the elements regarding their impact with the highest rate of "significant impact" score. By doing that, we can have a glimpse on how important those elements are in order to sustain CIP and finally, compare the elements response variability. With this exercise, we can make several conjectures: the lack of a clear idea of sustainability definition and the different interpretation of the same element, for example, in some cases, employee engagement could represent different meanings for each person who answered the same question, this situation could repeat itself throughout the rest of the elements.

There are some limitations that may influence the responses to this survey. Firstly, the elements were introduced without any particular order (alphabetical, number of bibliographic sources, personal experience, etc.), there was no introduction, that is, we did not use an example, situation or definition that could clarify any ambiguity concerning the elements presented, and lastly we did not ask if their impact perception was directly linked with their actual job experience.

The different grades used to measure the element impact included the following: *no impact, low impact, moderate impact and significant impact*. The accommodation of the elements is solely based on the number of significant impact "votes". The element **leadership** is the first regarding its impact over the sustainability of CIP, where 90% of the respondents believe it has a significant impact, while 7% think that it has a moderate impact and only 2% consider that it has low impact. On the other hand, for the element, **tools and methods for CI,** only 17% of the respondents believe it has a significant impact, while 54% thinks there is a moderate impact over the sustainability of CIP, 22% of low impact and only 7% believe it has no impact.

One the reasons to launch this survey was to test the element existence on the shop floor. This coherence, between theory and practice is validated, when seven of the 15 elements has a "no impact" score (47%), with only 2% for five elements. The element with the biggest percentage of "no impact" is **time management**, with 10%.

We then listed and categorized the elements by importance. In this case we used the "significant impact" score as the measuring parameter, in which the elements resulted in the following order:

- Leadership
- Employee engagement
- Communication management
- Organizational routines
- Organizational culture
- Training

Figure 1. Impact of elements regarding sustainability of CIP.

- Change management
- Resources
- Decision-making
- Performance of CI initiatives
- Knowledge management
- Diagnosis
- Time management
- Risk management
- Tools and methods

From Figure 1, we can observe that some elements have similar scores regarding "significant impact". From our results we separated the elements into four groups:

- Within the range from 0–24% we can include: time management, risk management, and tools and methods.
- From 25%-59%, we have: decision-making, performance of CI initiatives, knowledge management and diagnosis.
- From 60%-79%: communication management, organizational routines, organizational culture, training and change management.
- From 80%-100%: we have employee engagement and leadership.

By doing this exercise, and with a right amount of data it is possible to find common points between them, this practice can be translated to the other impact levels as well.

Discussion

The sustainability of CIP is in constant balance, within two states, one fluctuant and the other stable; this balance is perturbed or affected by a set of elements. We have selected a group of elements from the CI literature in order to measure their impact, by designing a self-assessment survey. Although only 41 responses were forthcoming, the results obtained not only confirm the existence of these elements within an industrial environment, but that they also demonstrate variability among some of them. This leads us to contemplate the interpretation of certain definitions.

For example, the results show that the first six elements (leadership, employee engagement, communication management, organizational routines, organizational culture and training), with the highest scores, (with an average 78% of significance impact), are highly linked to human interaction. This finding is linked with new organizational structures, where organizations are perceived as social systems, the human aspect and their efforts to contribute to the organization are highly valuable, as well as their adaptation of the company [Marin and Varoni, 2016].

Although some of these elements are easier to measure than others, the importance of human aspect is paramount, where the curiosity and desire to improve things is used as the base to make a continuously upgrade of skills and flexibility. [Bessant *et al.,* 1994], simultaneously those elements are classically related with middle or high ranks within an organization, implying the importance of having that synergy between the company strategy and its vision to improve.

On the other hand, if we take a look at the last three elements from our list, (time management, risk management and tools and methods), we obtain an average of 28% regarding low impact and only a 20% concerning significant impact.

This result delivers interesting interpretations, for example, the element **tools and methods**, is not as important as we might think (only a 17% of significant impact), and while we can see it as a technical aspect, its impact is not that relevant, while receiving knowledge in order to handle them is relevant (**training** scores 73% of significance impact).

By using the same analysis, **risk management**, has a low impact of 41%, while it can sound incongruous, since we are talking about CI and constant changes. However, **organizational routines** have 73% of significant impact, with this we can infer that routines are being perceived as a way to reach stability, by decreasing variability and incertitude.

The same exercise can be used with **time management** in which we detect some differences regarding scores, only 22% of the respondents believe that time management has a significant impact. For the sake of sustaining CIP, which can be considered contradictory, since we are talking about sustainability as maintaining a certain level over a period time, seeing time as a resource use properly.

All these comparisons and interpretations can only be possible when having a clear and evident definition of sustainability, a definition capable of adapting to a company environment, particularly within a CI framework, and set of elements with clear and understandable definitions connected with CI theories with the potential to characterize its sustainability.

With these illustrations, we conclude that not only the vision of sustainability is widely different within our respondents but also the interpretation of the elements evaluated, which we should not see as a disadvantage or handicap, on the contrary, it is an opportunity to analyze these differences and their reasons for existing. By that we ask ourselves, does the knowledge regarding CI affect the vision of sustainability? Is it necessary to introduce this broad sustainability definition in order to avoid possible "incongruences"? Does the business branch or company service have something to do with the element impact? Finally, does the business maturity have any kind of effect on the personal point of view?

Another important idea worthy of discussion is the comparison between the results from the ranking of elements from our sources (Table 1) and the results from the self-assessment survey. From the ranking we can see that there is a remarkable presence of the element "*Tools and Methods*". However, if we look at Figure 1, we can observe that the same element has the lowest percentage of "*significant impact*". This means that, from a purely theoretical point of view, the degree of importance of this element is quiet high. Meanwhile, when measuring this element from a real or more practical notion within CI programs, this element no longer has the same importance or impact, this comparison could open a new door to future studies.

Like every other study, no matter how well it has been designed, there will always be a number of limitations, which are beyond the control of the research team (Simon & Goes, 2013). In this study we encountered: time limitations, sample particularities, and the absence of prior research.

The self-assessment survey was conducted as the final part of the master-class, with a duration of approximately twenty minutes to complete it. Having such time constraint, particularly when dealing with around 15 elements to evaluate, with pronounced differences between them and different evaluation methods, can cause a sentiment of overwork from the respondent. As we explained before there was no use of examples of the elements, which could result in the misunderstanding of the questions, therefore answers could be potentially misleading. It is necessary to allow greater time to complete the survey, with extended introductions and potential examples of each element. Additionally, the use of other types of data collection methods, such as interviewing, could add more value since we may have additional information that is not necessarily reflected in the survey.

Other limitations include the small sample size. Around 45 people attended the master class, of which 41 participated in the questionnaire (91% response rate). This could make the findings statistically challenging, and formulating a hypothesis based on the links between elements difficult. The sample itself has the potential of selection bias, since the attendees of the master class held high-ranking positions within their companies. The responses provided could differ significantly to participants working in jobs closer to the operational and technical aspects of the production process. However, this presents us with the opportunity to expand our research, and reach out to a wider group of people within different organizations in different sectors. This would then provide us with a greater variety of points of views and opinions, which could highlight business reality and create tendency models specific to positions within a company and their respective sector.
Finally, it is important to consider the fact that the elements impact and their inter-relationships have not been fully researched in order to achieve CI sustainability. This presents us with a unique opportunity, scientifically and from a business viewpoint, to explore new horizons in operational excellence theories.

5 Conclusion and Further Research

CI is always on the move, changing and morphing in the search for excellence. Sustaining that dynamism does not obstruct that evolving characteristic, on the contrary it enhances the spirit of CIP. From early studies, we have come to the conclusion that the sustainability of CIP thrives within a two-state dynamic, one stable and the other fluctuant, where a group of elements characterize this changing behavior.

The objective of this article has been to present a compendium of elements that characterize the CIP sustainability. We have selected them from a specific literature review. Then, we have highlighted some of their principal features in order to better understand how they affect the CI endeavors, and in what way they are linked with changes or, conversely, if they can become stability factors.

Then, we present the main characteristics of a self-assessment survey that was designed with the objective of evaluating the knowledge of the respondents regarding CIP; evaluate the maturity level of their respective workplace and, finally, evaluate their perception over the impact that those elements have over the sustainability of CIP. By applying the same creed from CIP to our survey and taking into account the quantity of responses received, we have listed some improvement points that provide opportunities for further research. By using a common sustainability definition, we are able to avoid conjectures about irregular variabilities regarding that interpretation. By having a large amount of responses, we could obtain a representative sample of the whole population, and so doing, we are able to make sample comparisons and study their points of view regarding a particular key element, for example, it could be interesting to compare the responses from inexperienced respondents regarding CIP with an expert, and see if their answers differ and the reasons why. Using the same

definition exercise, adding small hints or examples on how the key elements affects the sustainability of CIP could be helpful not only to avoid undesirable variability, but to help the respondents to easily understand the purpose of the survey they are working with, while avoiding leading the questions.

Another relevant idea worthy of further analysis is the potential relationship between key elements, that is, the possibility that we could encounter elements directly correlated with others, or conversely, no relation whatsoever. Moreover, there is room for analysis regarding the element impact and CIP knowledge and how the answers concerning the impact over sustainability is related to the respondent knowledge.

6 References

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