Barriers to continuous improvement: perceptions of top managers, middle managers and workers

Eirin Lodgaarda,*, Jonas A. Ingvaldsena, Silje Aschehouga, Inger Gammea,

aSINTEF Raufoss Manufacturing, Box 163, N-2831 Raufoss, Norway.

* Corresponding author. Tel.: +47-9954-4358; Fax: + 47-6115-3625. E-mail address: eirin.lodgaard@sintef.no

Abstract

Continuous improvement (CI), as culture, tools and methods, is critical to manufacturing companies’ competitive position. Research has documented that as many as two out of three CI programs fail, in the sense of not meeting goals and expectations. While poorly designed CI systems and misguided use of tools and methods may explain some failed CI initiatives, surveys and expert polls indicate that the main barriers to CI success are organizational and managerial. This paper reports on a case study of barriers to CI. The case company, a medium-sized manufacturer of maritime systems, has achieved only partial success with CI, despite repeated efforts. Unsurprisingly, both technical and organizational barriers are important, but the relative importance attributed to the different barriers is strikingly dissimilar across hierarchical levels in the organization. While top managers attribute the limited success to shortcomings of information systems and improvement methods, workers primarily point to limited support and commitment from management, in addition to other organizational factors such as lack of involvement, motivation and teamwork. Middle managers acknowledge both groups of barriers, but tend to agree more with the workers’ view. If these findings are generalizable beyond the single case-company, there are important implications for both research and practice. Research should appreciate the complex attribution of barriers, by complementing conventional surveys with in-depth qualitative analysis. Practically, unless the opinions of different occupation groups at different hierarchical levels are listened to, efforts to overcome the barriers may be misguided. In addition, top managers should learn to take the roles of CI champions, who not only allocate resources to CI, but also actively encourage, follow-up and reward the appropriate use of CI tools and methods.

Keywords: Continuous improvement; production management; organizational behaviour

1. Introduction

Worldwide, manufacturing companies continuously strive to sustain their competitive advantages. Common strategies for competitiveness include production systems focusing on lean and quality.

The Toyota Production System (TPS) is by many considered to be the world benchmark in production improvement programs [1]. In addition, many companies experience customer demands to comply with the ISO organization’s quality standards (e.g. ISO 9001, ISO TS 16949). Common to TPS and quality standards is a systematic approach to problem solving throughout the organization, known as continuous improvement (CI).

CI may be defined as a culture of sustained improvements, targeting the elimination of waste in all systems and processes of an organization [2]. Bhuiyan and Baghel further describe CI as something that occurs through incremental improvements or through radical improvements based on a new technology or innovative ideas. Sometimes, large improvements are the result of many incremental improvements over time. CI may also be regarded as a number of approaches, tools and techniques for finding and eliminating waste and improving quality [2]. Today, the best-known approaches for CI are: Total quality management (TQM), Six sigma, lean, balanced scorecard, and hybrid methodologies such as lean six sigma [2, 3].

Even though CI has been known for decades, and many books have been written about its practical implementation, companies often find their CI programs in a fledgling state [4]. The failure rate is high [5]; as many as two out of three CI initiatives fail to deliver the desired results [6]. Companies
often achieve significant improvements in the short run, but CI ultimately falls apart. Clearly, there is a need to understand why the failure rate is high, and what companies can do to make their CI initiatives more successful and sustainable.

Against this background, this paper empirically investigates which barriers to CI top managers, middle managers and workers consider important. Do the different groups list the same barriers? Do the different groups put equal emphasis on the different barriers? If not, how can we explain the differences in perception? Since several studies of CI implementation stress the importance of integrating a technical infrastructure with the soft, behavioral aspects [7, 8], we explore both technical and organizational factors influencing CI.

The article has the following structure: First, the theoretical background for CI is outlined and the literature on barriers to CI is reviewed. Second, we present a case study of a company that specializes in manufacturing of high-end, complex thrusters. Over the last years, their CI results have been mixed, and we report their perception of barriers. Third and finally, conclusions and implications for researchers and practitioners are presented.

2. Nature of continuous improvement

Both American and Japanese manufacturing have played a significant role in shaping the evolution of CI [9]. Nowadays, CI is a core principle regardless of which kind of management system the organization has chosen [9]. There are many definitions of CI. Two of them are:

"A continuous stream of high-involvement, incremental changes in products and processes for enhanced business performance"[3], and

"A company-wide process of focused and continuous incremental innovation"[10].

These definitions emphasize one common aspect: Through employee involvement in the entire organization, CI aims to improve the organization's processes in order to meet customer requirements.

CI can occur through incremental improvement and through radical change [2]. Incremental improvement refers to small and gradual improvement, while radical change refers to improvement based on innovative ideas or new technology that may require investments. An extended period with incremental improvements can result in a major improvement. Consequently, CI is a process of change in which superior performance is attained[11].

Most organizations are not consistently addressing day-to-day problems, but instead have developed sophisticated "firefighting" skills [12]. This shows another important factor in successful applications: that the CI process is embedded in the organizational culture [13], so that problem-solving is a natural road to improvement [14].

Different events may trigger CI activities. The first type of initiative for CI occurs when there is a deviation from a desired state, giving rise to a statement of a well-defined problem to be solved. For example, workers may revise a standard practice if it produces unexpected or anomalous results. The second type of initiative for CI occurs when there is no deviation, but one still sees the opportunity for improvement through creative thinking.

3. Factors influencing continuous improvement

3.1. Management

In the literature, management commitment and involvement are highlighted as important success factors when implementing and performing CI [4, 15]. Jakobsen and Poppendieck document the importance of management commitment through a study in which significant and sustainable improvement was achieved due to the role of the management team [16]. Managers mentored the improvement teams to ensure completeness of the improvement program, and supported the improvement activities. Bhuian and Baghel mention another dimension of management’s role [2]: There is no clear way of prioritizing major improvement programs by management. Another important element is that management needs to pay close attention to follow-up mechanisms to ensure sustainability and the ability to capture and create knowledge [12].

3.2. Organizing for continuous improvement

The application of CI within the entire organization presents a variety of challenges. Garcia-Sabater and Marin-Garcia report that in many cases, there is a lack of strategic orientation with respect to CI [4]. This finding may indicate that the organization has not sufficiently reflected on how to organize for integration of CI at all levels.

The experience of disappointment and failure with CI reported by many organizations derives mainly from a lack of understanding of the behavioral dimension [5]. Too much focus on CI tools and methods, to the neglect of human factors and how CI behavioral patterns emerge in the workplace, is also reported as a pitfall in a study by Ljungström and Kjelšjö [3]. Jakobsen and Poppendieck also highlight the importance of obtaining commitment from employees, in addition to commitment from management [16]. A study by Yan and Makinde point out that an effective communication channel between management and employees working with the CI programs, is important to ensure sustainability [17].

The composition and structure of the improvement team are crucial to success, and one must be knowledgeable about both the improvement approach and the issues to be improved [12]. Normally a CI team is established to solve a specific issue, and the team includes personnel who have the necessary competence and mandate to achieve the desired improvement. People working with improving specific issues should be the same people who normally work on those issues [16]. This view is supported by Jarvinen et al. who point out the importance of getting the experts together, and consequently ensuring acceptance through participation [18]. Through involvement, employees gain a sense of belonging and satisfaction, and they are allowed to put their creativity, knowledge and skills to good use. Intrinsic motivation of individual team members is another success factor [19]. The use of cross-functional teams with close collaboration and good communication between teams is an enabler for successful implementation of CI [4].

Soares et al. have found that perhaps the greatest challenge in the accomplishment of improvement initiatives is to ensure
that the improvement persists over time [19]. In order to be sustainable, changes should be propagated throughout the organization to all employees involved, both inside and outside the CI team [20]. Otherwise, only a few people will know about it. The improvement should be codified as a new standard and spread throughout the organization as “best practice” [14].

3.3. Continuous improvement method

CI is achieved through application of a number of methods and techniques [2]. If the goals are to reduce waste, streamline the flow of the manufacturing process and improve product quality, a systematic approach is preferable to ad-hoc problem solving. A systematic approach helps the improvement team stay focused on completion of the improvement initiative by carrying out pre-defined steps until goal satisfaction prevails [21].

It is important for companies to select proper CI methods according to their needs, and demand that CI is carried out throughout the organization [13]. All CI methods have strengths and weakness, which should inform management’s choices. Then, the chosen methods should be applied correctly to the appropriate processes in the organization and be supported by planning, training and monitoring of the CI activities.

Accomplishment of improvement by applying a defined method requires both knowledge about the method and the skills to perform the method in the correct way. A study by Kitching found that learning by interacting was considered more important than externally provided training [22]. These findings support the claim that knowledge about the method is enhanced by prior accomplishment of improvements. Nevertheless, basic knowledge about the methods must first be established [23].

Another important element is that management needs knowledge about the chosen method and implementation of CI to be able to understand what CI is all about [24]. Sobek and Smalley report that many managers who have chosen the PDCA cycle as a CI method, are not familiar with the PDCA or do not really understand it [12].

3.4. Capturing and sharing of knowledge

In a cyclic process of implementing changes, studying the results and reflecting on the lessons learned, new knowledge is derived. Both successes and failures may lead to new knowledge [25]. Reflective communication enhances learning, ultimately resulting in higher performance. Reflective communication is a process whereby the team members transfer and combine insights to reach a common understanding of what the experience or information means [26]. Throughout the process, participants are encouraged to ask questions, challenge assumptions and seek different perspectives.

Sharing of knowledge created in the CI process is often challenging, due to the lack of support systems. Knowledge created in the CI processes may be documented as explicit knowledge, by text and visualization, on a single sheet of paper with A3 format [12]. The philosophy behind this approach is to develop deep learning about the improvement issue to solve in addition to developing skilled improvement-solvers. A3 helps document progress, what is learned inside each of the improvement programs in addition to transfer of knowledge between the different improvement programs.

4. Research design

This study is part of a national research project concerning work organization and operations in the Norwegian manufacturing industry. The reported findings are the results of a two-year in-depth single case study. As the research team has worked closely with the case company for two years, we have gained thorough understanding of their operational challenges and opportunities.

The case company is a manufacturing company in Norway with engineering to order based production. The company experiences global market pressure to deliver high quality and reliable products. It employs approximately 300 employees, and has an annual turnover of approximately 150 million US$. The research design is qualitative case study [27, 28]. A protocol describing research questions and data collection methods was developed and discussed within the research team. Several sources of evidence were collected during the case study to address construct validity [28]. This includes semi-structured interviews, unstructured interviews, field visits, observations, access to databases, and document reviews. In addition, we arranged workshops with the company, where CI and the usability of its supporting technical system were discussed. Thirteen formal interviews were conducted at the case company's location over a two-year period. This allowed for reflections in between the interviews and for the development of more specific questions.

The collected data was analyzed in order to identify perceived barriers that hinder CI performance in the organization. Transcribed interviews and company documentation were coded and visualized in data displays to find patterns and recurring themes [29]. Findings were also discussed with company managers, adding respondent validation.

The results in this article should be regarded as indicative, as they are based on a single case study. Although a single case only gives limited generalizability, it is possible to obtain an extensive comprehension of the phenomena studied. Using a single case can, according to Yin [30], “offer a significant contribution to knowledge and theory building.”

5. Results and discussion

The case company is organized in functional departments, with multiple hierarchical levels (3-6 dependent on department function).

All employees are expected to report and contribute to solving all kinds of operational problems including deviations in their daily work. To a large extent, such problem solving is carried out in all departments every day. Still, the company experiences that the same types of deviations and quality issues repeat themselves, often multiple times. This indicates that the company has challenges when it comes to how to
In order to identify the perceived barriers to CI at different organizational levels, top managers, middle manager and workers were interviewed. Results are summarized in Table 1. Barriers are categorized according to the literature review in section 3. An ‘x’ indicates that the group of informants (horizontal axis) focused on this barrier (vertical axis) as one of the main barriers with regard to achieving success with CI.

Table 1. Perceived barriers to CI.

<table>
<thead>
<tr>
<th>Category</th>
<th>Perceptions of barriers</th>
<th>Top managers</th>
<th>Middle managers</th>
<th>Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>Limited management commitment</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Limited support from management</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CI not a daily focus</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Organizing</td>
<td>Roles/responsibilities not defined</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>for CI</td>
<td>Lack of involvement</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Lack of teamwork</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Lack of motivation</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>CI method</td>
<td>Not according to best practice</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not user-friendly system [technical]</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Not covering all relevant CI initiatives</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not adding sufficient value</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Lack of knowledge about CI method</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td></td>
<td>Lack of capturing and sharing of knowledge</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Table 1 shows that perceptions of barriers for achieving CI are strikingly dissimilar across hierarchical levels in the organization. While top managers primarily attribute the limited success to shortcomings of improvement methods and supporting technical systems, workers primarily point to limited support and commitment from management, in addition to other organizational factors such as lack of involvement, motivation and teamwork. Middle managers acknowledge both groups of barriers, but a closer inspection of the table reveals that they agree more with the worker. In general, the findings indicate that employees at different hierarchical levels perceive different barriers when embarking on CI. Bhasin makes similar observations in relation to the implementation of lean in the U.K.; among other things, workers and managers disagree on whether management’s attitude was appropriate for lean to prosper [31]. Often, people from different functions and hierarchical levels have different backgrounds, and hence different world views [32].

More specifically, interviews with top managers at the case company revealed that a holistic view on the determinants of CI success was lacking. Their main focus was on how to achieve CI by choosing best practice methods and implementing a user-friendly technical system for documenting and sharing information. Many managers thought that investments in new technology would solve their information-sharing challenges. However, as shown by previous studies, installing new systems for information sharing is seldom the only solution – it is equally important to ensure that there is willingness among the people to share information [33]. A surprising finding is that top managers apparently do not acknowledge the importance of their own support and commitment to the CI program. Exiting research shows that the main driving force to succeed with CI is management commitment and active leadership [4, 15, 16].

Middle managers pointed to most types of barriers explored in the literature. Curiously, they were concerned about lack of top management commitment, but rarely reflected on their own roles as managers of CI. One of the middle managers explained how he thought CI implementations should proceed: “It should start from the top management and be implemented further down in the organization structure, or start with the whole organization at the same time. If the process starts at the bottom, and nothing happens, the process will stop halfway, and nothing more will happen. Hence, it will be difficult to start all over again.”

Both middle managers and workers reported that involvement, teamwork and motivation were lacking. Top managers, however, did not have this as a key focus area. Bessant et al. highlight the behavioral dimension, more than specific tools and methods for achieving CI [5]. Teamwork and collaboration foster skill development across functional boarders, and contribute to a common understanding of challenges. One of the top managers mentioned that he involved both middle managers and workers in problem solving. Nevertheless, there was a shared opinion among middle managers and workers that there was a lack of employee involvement in the CI processes. Involvement is identified in the literature as a key component for integration of CI at all levels [4]. Insufficient collaboration and different expectations to the CI processes at different hierarchical levels may be reasons why informants focused on different barriers. And this recognition reveals that increased collaboration with employees in all levels and across of the organization is with potential of improvement. Their opinion of lack of involvement, teamwork and motivation could be explained by following: normally employees want to feel appreciated by involvement and the possibility to contribute with their knowledge and experience.

The following quotation from an operator is illustrative of the workers’ perception of barriers: “I tried to contribute on solving some improvement issues, but experienced that it did not work very well since there were little response from the management. Hence, the improvement process came to an end.” If the CI initiatives are managed in this way, the motivation of the workers will be poor and CI will fall apart after a short time [5]. Managers did not expect operators to document the improvement activities in the existing technical system or be well trained in their chosen CI method. This could be a reason why the workers were not focused on barriers related to CI method and the technical system. It should be noted that only the managers had been trained in CI method and how to use the supporting technical system.

Despite important differences between the hierarchical levels, our informants also agreed on some of the barriers. Insufficiently knowledge about CI methods and lack of
knowledge sharing were mentioned directly or indirectly in every interview. The fact that all informants focused on these barriers, indicates that basic knowledge about the CI method and knowledge sharing are seen as important, as described in the existing literature [12, 23]. One reason for this common opinion may be that employees recognize that CI can help them in improving productivity indicators and satisfying customers. Therefore, they appreciate the importance of knowledge about the approach, so that they can contribute in the problem solving and knowledge sharing.

6. Conclusion

This study indicates that employees at different hierarchical levels perceive barriers to CI differently. We find that top managers attribute the limited success to shortcomings of information systems and improvement methods, and that workers primarily point to limited support and commitment from management, in addition to other organizational factors such as lack of involvement, motivation and teamwork. Middle managers acknowledge both groups of barriers, but tend to agree more with the workers.

Although much research has been conducted on barriers to CI, little focus has been directed towards identifying opinions of different groups at different hierarchical levels in an organization. If the findings of this study are generalizable, it follows that future empirical research on barriers to CI should sample a broad range of informants in each organization. Simply asking management or CI specialists what the barriers are may re-produce biased perceptions. Preferably, quantitative or structured qualitative data should be complemented by unstructured qualitative data so that it is possible to understand the informants’ worldviews, and address why the different groups perceive barriers differently. The same logic of diverse opinions probably applies to the different groups perceive barriers differently. The related questions of enablers and success factors as well; these may also be perceived differently depending on the individual’s hierarchical position.

The main practical implication of this study is that unless the opinions of different groups at different hierarchical levels are listened to, efforts to overcome barriers to CI may be misguided. In particular, top managers should take care to consult different groups of employees before choosing a path of action. Additionally, there should be put in place mechanisms that create confidence and trust between groups at different hierarchical levels.

This study also supports common recommendations about the role of top management in CI programs. Only allocating resources to CI and empowering employees to respond to deviances and make changes may be insufficient. Top managers should also actively encourage, follow-up and reward the appropriate use of CI methods.

Acknowledgements

The current research was funded by the Norwegian Research Council through the project "Adaptive and Integrated Production Systems (TIP)".

References


