COMMUNICATING CONTINUOUS IMPROVEMENT IN MANUFACTURING COMPANIES: DIVERGENCIES BETWEEN CURRENT PRACTICE AND THEORY

Carina Larsson, Mattias Strand, Anne Persson, Anna Syberfeldt
University of Skövde, Sweden

Abstract

Succeeding with continuous improvement is important for manufacturing companies to increase the competitive edge. In order to succeed with continuous improvement, literature shows that communication of improvement indicators need to be integrated with communication of control indicators. This paper identifies divergencies between current practice and theory in the communication of CI, which can be a reason for why manufacturing companies fail in their CI implementation. An integration of control indicators and improvement indicators could improve continuous improvement results, increasing business performance.

Keywords: Performance measurement, Communication, Continuous improvement, Manufacturing

Introduction

Manufacturing companies all over the world experience increased competition, and continuous improvement (CI) is commonly used to increase the competitive edge, by, e.g., improving productivity, ensuring quality and increasing delivery reliability (Hyland et al., 2007). CI can be seen as a translation of the Japanese word kaizen, indicating a process of continuous incremental improvement of the standard way of working (Chen et al., 2001). Important activities to succeed with CI in manufacturing companies are: 1) to define the performance measures; 2) to clarify the relationship between the different types of performance measures; 3) to define improvement targets and align to them with the company targets; and 4) to communicate the performance measures (Bititci and Nudurupati, 2002; Jørgensen et al., 2004; Kumar et al., 2009). Clarifying improvement targets and aligning them with company targets is important in order to increase the employees' understanding when implementing improvement initiatives (Jayaraman and Teo, 2010; Kumar et al., 2013). Communication of targets and results is important to keep up the interest for CI (Gonzalez Aleu and Van Aken, 2016; Jayaraman and Teo, 2010; Kumar et al., 2009), while not aligning improvement targets with company targets jeopardizes the success of CI, opening for frequent changes of targets when leadership is changed in the company (Näslund, 2013). The communication of performance measures should, hence, support the alignment of improvement targets with company targets (Jayaraman et al., 2012; Näslund, 2013).

The importance of and systems for defining performance measures are well researched and have been known for a long time, see for example Kaplan and Norton (1996), Cross and Lynch (1988), and Neely and Adams (2001). Bititci and Nudurupati (2002) identify two different types of performance measures; control indicators and improvement indicators. Control indicators are needed to keep control of the process, while improvement indicators are needed to measure continuous improvement (CI) (Bititci and Nudurupati, 2002). The term performance measures is in this paper used as an umbrella term for both types of indicators. Understanding the

relationship between control indicators and improvement indicators, and developing a loop control system, is important in order to effectively utilise the performance measures for CI in manufacturing companies (Kang et al., 2016).

Despite all research-based guidelines on how to define performance measures, to set targets, to align them and, which is the main concern of this paper, to communicate them, many manufacturing companies fail in their CI work (Bhasin, 2012; McLean and Antony, 2014). This paper seeks to identify divergencies between current practice and theory concerning communication of CI in manufacturing companies, to propose a model and recommendations for how to communicate CI in manufacturing companies. Effective communication of CI can improve employees understanding of targets and strategy, and enhance performance (Jaca et al., 2013; Ukko et al., 2007).

Theoretical framework

Performance measures can be defined as metrics quantifying the efficiency and effectiveness of actions (p. 81, Neely et al., 1995). Effective performance measures enable the organisation to assess whether targets are achieved and also facilitate improvements (Lebas, 1995). A great deal of research have focused on the shift from traditional performance measures, i.e. only financial measures, to multidimensional performance measures such as both financial and non-financial measures (e.g., Kaplan and Norton, 1996; Lynch and Cross, 1992; Neely and Adams, 2001). The balanced scorecard by Kaplan and Norton (1996) is said to be a powerful tool connecting performance measures and strategy. The use of multi-dimensional performance measures makes performance more effective, but by 2011 only one third of the organizations used multi-dimensional performance measures (Tung et al., 2011). Tung et al. (2011), among others, mean that organizations need to increase the use of other perspectives in the Balanced Scorecard (Kaplan and Norton, 1992) than the financial perspective.

Performance measures are critical for CI, and measuring performance enables and directs CI (Kang et al., 2016). When researchers and companies started adding non-financial performance measures to existing financial performance measures, CI indicators such as process cost reduction, quality and process cycle time were included among the performance measures (Chenhall and Langfield-Smith, 2007). Non-financial performance measures have also been linked to CI such as e.g. related to Just-in-time and Total Quality Management (Young and Selto, 1991). Performance measures are not independent, and identifying dependencies between them can be useful when utilizing them for CI (Kang et al., 2016). Kang et al. (2016) investigates such dependencies concerning quality, productivity and maintenance. They conclude that further investigation is needed on this topic.

Already Globerson (1985) stated that performance measures should be communicated in a loop in order to act on divergencies between targets and outcome, and Neely et al. (1997) proposed a framework with follow-up of results based on this loop. This loop of communicating performance measures should focus on and stimulate CI (Kaplan and Norton, 1992; Lynch and Cross, 1992; Medori and Steeple, 2000). Existing theory is summarized in a model (Figure 1), describing how communication of CI needs to be performed. Improvement indicators and control indicators are integrated in the same loop. This model may assist manufacturing companies in integrating CI into daily performance, to focus on CI on a daily basis and to succeed with CI.

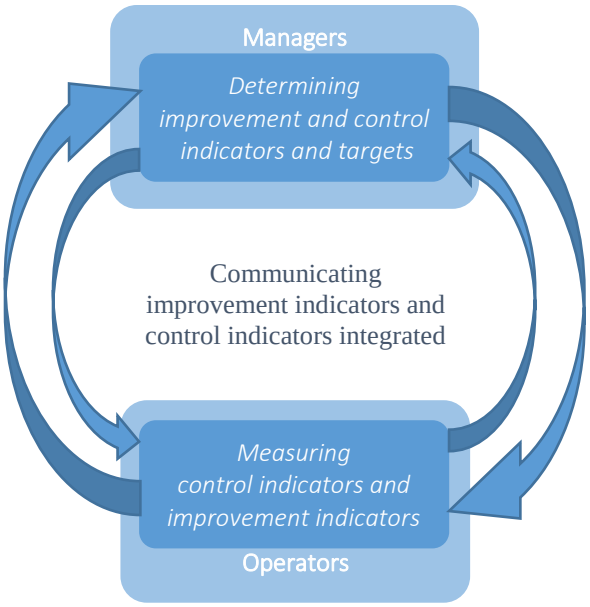

Figure 1. Theoretical model for communication of CI

Research methodology

This paper is based on a theoretical and an empirical study in the form of a case study.

The theoretical study is a traditional literature review (Jesson et al., 2011). The review searched for one or two of the terms "CI", "lean", "improvement" and "performance measure", adding the term "manufacturing" and in some searches the term "communication". The main data sources were Scopus and WorldCat Beta, and results were limited to the subject areas of "engineering", "decision science", and "business, management and accounting" in order to exclude papers outside the performance measurement area. The searches were refined using a snowball approach according to the method of Rumsey (2008), which meant working backwards, following citations in the identified articles, and forward, where the articles had been cited. Based on the literature review, a model for communication of CI was developed (Figure 1). The model serves as a frame for contrasting the findings of the case study.

The purpose of the case study was to identify divergencies between current practice and theory concerning communication of CI in manufacturing companies. It did so by answering two questions: 1) How is communication of CI performed?; and 2) How are CI targets connected to daily performance targets?. The second question was included in order to compare how communication was actually performed to the approach suggested in the literature.

The study was performed at a Swedish manufacturing SME, the Vara plant of Volvo Penta. It was conducted by following the suggestions and procedures proposed by Yin (2014), including the data collection techniques observation, interviews and a survey.

The observation of information boards focused on existing communication about CI efforts, of control indicators, of company targets, and tried to identify connections between improvement indicators, control indicators and company targets. Interviews were done with two managers, two middle managers and three operators in order to get an overview of current practice. Interviewees were chosen by one of the managers. The interviews consisted of two open-ended

questions, each supported by three sub-questions. The questions concerned the employees' perception of improvement indicators and control indicators, the communication of them, and the employees' opinion about them. After the interviews, a survey was done in one department in order to deepen the study. A company manager chose the department because it was deemed a suitable target for an improvement effort in case suggestions for improvements were discovered. The survey was done with all 22 operators at the chosen department, working the day of the survey. The questions were based on the literature review.

In the analysis, results from the case study were compared to theory, identifying divergencies between current practice in the company and theory. Some opportunities to improve communication of CI in the company were identified in the analysis. The company stated an ambition to implement a selection of the identified opportunities for improvement in the department subjected to the survey, and later on all over the company. The implementation process will be part of future research.

Empirical results

Studying communication boards at the Vara plant, one information board for control indicators and one information board for improvements at each department were identified. A middle manager told that they focused at one information board at a time. This indicated that improvement indicators and control indicators were followed up and communicated in separate loops. The company communicated a CI target of number of improvements per employee and year, followed up monthly. This CI target was chosen in order to put focus on CI and get CI activities started. The company also followed up on the cost saving resulting from CI, although this was not frequently communicated. The connection between CI and control indicators was identified to be weak. There was a company CI target, the same target as on department level. No connections between other company targets and CI could be identified.

When asking about the connection between CI and control indicators in the interviews, answers from managers were univocal. CI improved performance, but the connection was unclear and the control indicator results could not be clearly traced back to CI. The main contribution from CI had, according to a middle-manager, been on quality improvements. Both managers and middle-managers meant that the connection between CI and control indicators was weak, and needed to be strengthened. The main reason for not integrating the measures was, according to the plant manager, to make it simple to work with and follow up CI.

In the survey with the operators two questions were asked; 1) According to your perception, are the improvement targets connected to the control targets on company level? and 2) According to your perception, are the improvement targets connected to control targets on department level?. Responses were graded from 1 to 6, 1 being "No, not at all" and 6 being "Yes, clearly". Out of the 22 potential respondents, 20 answered the questions. The resulting mean value concerning the connection between improvement targets and control targets were 2.9 at company level, and 3.7 at department level. The conclusion is that the operators do see some, but no clear connections between improvement targets and control targets. The result is presented in Table 1.

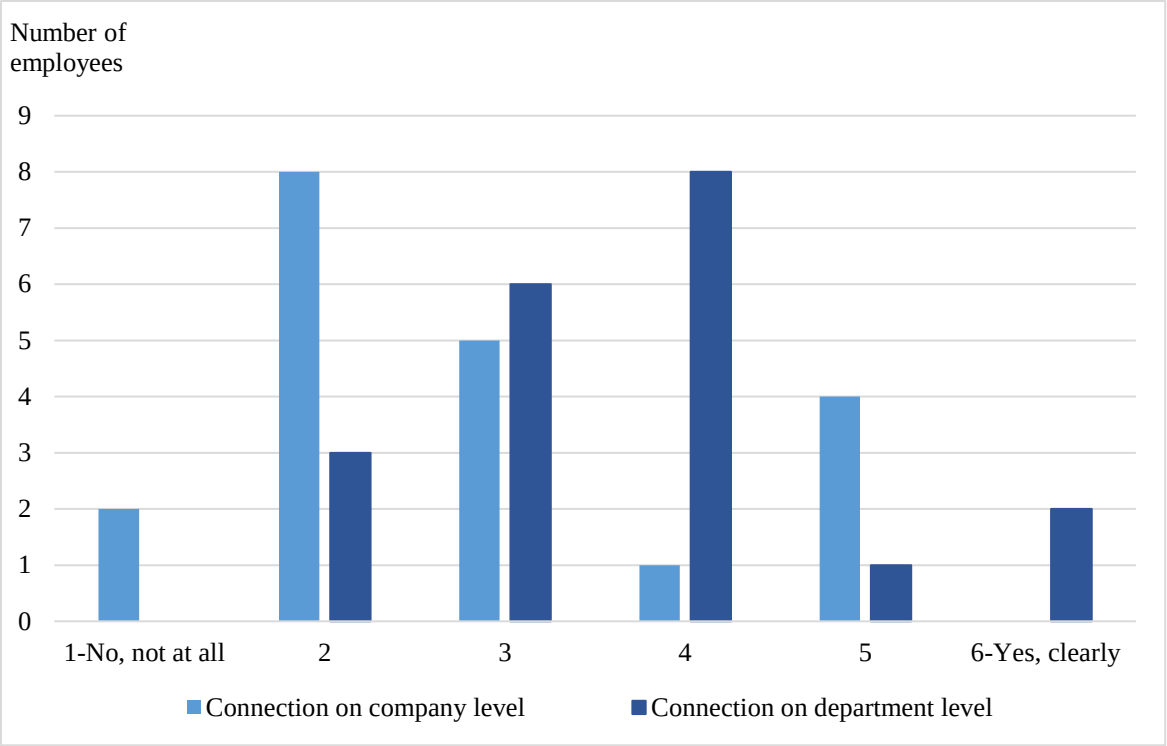

Table 1. Survey result concerning the connection between improvement targets and control targets at the Vara plant

Discussion

Literature concludes that the communication of improvement indicators needs to be integrated with the communication of control indicators. The empirical results, however, indicates that this integration was not implemented in the case study company. Based on the empirical results, existing communication of improvement indicators and control indicators can be illustrated as in Figure 2. This figure illustrates the two loops of communication in current practice, one for control indicators and one for improvement indicators.

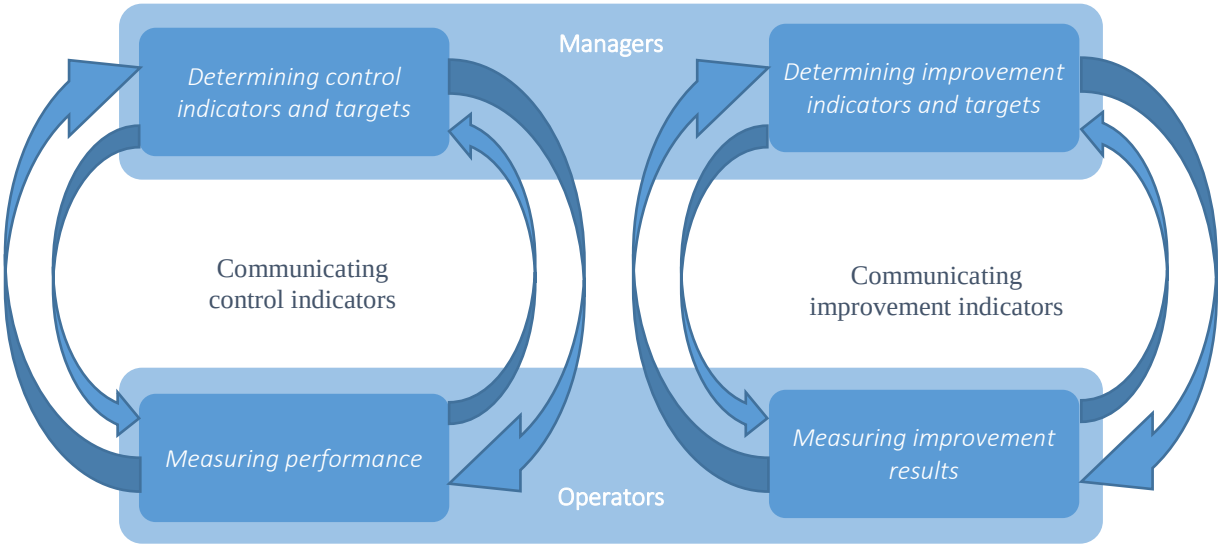

Figure 2. Empirical model of current practice of communication of improvement indicators and of control indicators

This study indicates that there is a divergence between literature and practice concerning how CI is communicated in manufacturing companies. Theory recommends communication of improvement indicators and of control indicators to be integrated, while this empirical study indicates that communication of CI and of daily performance are not integrated.

Conclusion

Succeeding with continuous improvement is important for manufacturing companies to gain or sustain the competitive edge in a highly globalized world. In order to succeed with continuous improvement, literature shows that communication of improvement indicators need to be integrated with communication of control indicators (Figure 1). This case study, performed at a manufacturing company in Sweden, indicates that communication of improvement indicators and of control indicators are not integrated, but is performed without clear connections (Figure 2). This divergence can be a reason for why many manufacturing companies fail in their CI implementation. The indication from this case study needs to be tested further in order to either strengthen or disprove it. In addition, it may also be interesting to note that all communication of performance measures was conducted through communication techniques that were analogue and not digital. Hence, it would also be interesting to study if and how IT digital technology could facilitate communication and potentially alleviate the impact of problems.

Acknowledgements

The authors are grateful to the KK environment INFINIT at University of Skövde, Sweden, for providing funding for this project. They also wants to thank Volvo Penta, Vara plant, for their cooperation and willingness to share information and experience.

References

Bhasin, S. (2012), "An appropriate change strategy for lean success", *Management Decision*, Vol. 50**,** pp. 439-458.

Bititci, U. and Nudurupati, S. (2002), "Driving continuous improvement", *Manufacturing Engineer*, Vol. 81**,** pp. 230-235.

Chen, J. C., Dugger, J. and Hammer, B. (2001), "A Kaizen Based Approach for Cellular Manufacturing System Design: A Case Study", *JOTS The Journal of Technology Studies*, Vol. 27.

Chenhall, R. H. and Langfield-Smith, K. (2007), "Multiple Perspectives of Performance Measures", *European Management Journal*, Vol. 25**,** pp. 266-282.

Cross, K. F. and Lynch, R. L. (1988), "The "SMART" way to define and sustain success", *National Productivity Review*, Vol. 8**,** pp. 23-33.

Globerson, S. (1985), "Issues in developing a performance criteria system for an organization", *International Journal of Production Research*, Vol. 23**,** pp. 639-646.

Gonzalez Aleu, F. and Van Aken, E. M. (2016), "Systematic literature review of critical success factors for continuous improvement projects", *Lean Six Sigma Journal International Journal of Lean Six Sigma*, Vol. 7**,** pp. 214-232.

Hyland, P. W., Mellor, R. and Sloan, T. (2007), "Performance measurement and continuous improvement: Are they linked to manufacturing strategy?", *International Journal of Technology Management*, Vol. 37**,** pp. 237-246.

Jaca, C., Viles, E., Jurburg, D. and Tanco, M. (2013), "Do companies with greater deployment of participation systems use Visual Management more extensively? An exploratory study", *International Journal of Production Research*, Vol. 52**,** pp. 1755-1770.

Jayaraman, K., Kee, T. L. and Soh, K. L. (2012), "The perceptions and perspectives of Lean Six Sigma (LSS) practitioners: An empirical study in Malaysia", *The TQM Journal*, Vol. 24**,** pp. 433-446.

Jayaraman, K. and Teo, L. K. (2010), "A conceptual framework for critical success factors of lean Six Sigma: implementation on the performance of electronic manufacturing service industry", *International Journal of Lean Six Sigma*, Vol. 1**,** pp. 191-215.

Jesson, J., Matheson, L. and Lacey, F. M. (2011), *Doing your literature review: traditional and systematic techniques*, Sage Publications.

Jørgensen, F., Boer, H. and Gertsen, F. (2004), "Development of a team-based framework for conducting self-assessment of continuous improvement", *Journal of Manufacturing Technology Management*, Vol. 15**,** pp. 343-349.

Kang, N., Zhao, C., Li, J. and Horst, J. A. (2016), "A Hierarchical structure of key performance indicators for operation management and continuous improvement in production systems", *International Journal of Production Research,* Vol.**,** pp. 1-18.

Kaplan, R. and Norton, D. (1992), "The Balanced Scorecard: Measures That Drive Performance", *Harvard Business Review,* Vol.

Kaplan, R. S. and Norton, D. P. (1996), *The balanced scorecard,* Harvard Business School Press Boston, Boston, Mass.

Kumar, M., Antony, J. and Douglas, A. (2009), "Does size matter for Six Sigma implementation?: Findings from the survey in UK SMEs", *The TQM Journal,* Vol. 21**,** pp. 623-635.

Kumar, S., Naveen, K., Luthra, S. and Haleem, A. (2013). "Enablers of lean six sigma implementation in business environment: E review". *International conference on smart technologies for mechanical engineering.* New Delhi.

Lebas, M. J. (1995), "Performance measurement and performance management", *International Journal of Production Economics,* Vol. 41**,** pp. 23-35.

Lynch, R. L. and Cross, K. F. (1992), *Measure up!: The essential guide to measuring business performance,* Mandarin.

Mclean, R. and Antony, J. (2014), "Why continuous improvement initiatives fail in manufacturing environments? A systematic review of the evidence", *International Journal of Productivity and Performance Management,* Vol. 63**,** pp. 370-376.

Medori, D. and Steeple, D. (2000), "A framework for auditing and enhancing performance measurement systems", *International Journal of Operations & Production Management,* Vol. 20**,** pp. 520-533.

Neely, A. and Adams, C. (2001), "The performance prism perspective", *Journal of Cost Management,* Vol. 15**,** pp. 7.

Neely, A., Gregory, M. and Platts, K. (1995), "Performance measurement system design", *International Journal of Operations & Production Management,* Vol. 15**,** pp. 80-116.

Neely, A., Richards, H., Mills, J., Platts, K. and Bourne, M. (1997), "Designing performance measures: a structured approach", *International journal of operations & Production management,* Vol. 17**,** pp. 1131-1152.

Näslund, D. (2013), "Lean and six sigma–critical success factors revisited", *International Journal of Quality and Service Sciences,* Vol. 5**,** pp. 86-100.

Rumsey, S. (2008), *How to Find Information: a Guide for researchers,* McGraw-Hill International.

Tung, A., Baird, K. and Schoch, H. P. (2011), "Factors influencing the effectiveness of performance measurement systems", *International Journal of Operations & Production Management,* Vol. 31**,** pp. 1287-1310.

Ukko, J., Karhu, J. and Rantanen, H. (2007), "How to communicate measurement information successfully in small and medium-sized enterprises: a regression model", *International Journal of Information Quality,* Vol. 1**,** pp. 41-59.

Yin, R. K. (2014), *Case study research: Design and methods,* Sage.

Young, S. M. and Selto, F. H. (1991), "New manufacturing practices and cost management: a review of the literature and directions for research", *Journal of Accounting Literature,* Vol. 10**,** pp. 265-298.