The use and importance of CI tools: A comparison of Europe and Australia

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Abstract

The effective implementation of continuous improvement (CI) requires tools for accomplishing CI incentives to encourage and reward employees to engage in CI and problem finding and problem solving tools. While there is a significant range of tools and incentives available, they need to be selected to suit the organisation and its employees rather than making the employees and the organisation fit the tools. Australia traditionally lags behind Europe in the adoption of improvement tools and techniques. This paper seeks to identify if there are any significant differences in the relative importance and use of the CI toolbox between European and Australian firms. The results show that there are some significant differences between the Europe and Australia and suggestions are put forward to explain these.

Introduction

It is generally acknowledged that in today's dynamic and turbulent environment firms have to develop capabilities that allow them to be very flexible and agile and at the same time be able to incorporate new (product and process) technologies, develop and produce better products faster and be a fully-fledged partner in supply chains. This flexibility and agility calls for companies to increase their effectiveness, exploit synergies and learn throughout all areas of their operations. The necessity to learn has been especially emphasised by various writers. De Geus (1988) proposed that the ability of an organization to learn faster than its competitors may be the company's only sustainable competitive advantage. The rate at which individuals and the organisation learns is likely to become it's only sustainable competitive advantage, especially in knowledge-intensive industries (Stata, 1989). Nonaka (1991) asserted that in times when the only certainty is uncertainty, the one sure source of lasting competitive advantage will be knowledge. Companies in all areas of endeavour continually search for sources of sustainable competitive advantage and tools and techniques to improve their operational efficiency.

Continuous Improvement and strategy

CI methods have become widely adopted and regarded as providing an important component of increased company competitiveness. Indeed McAdam, Stevenson and Armstrong (2000) argue that development of

a CI culture by companies is strongly associated with the development within companies of an innovation culture. The proposition that a CI culture gives rise to an innovation culture is of particular significance if one takes the view that development of an innovation culture is critical to the ability of companies to develop and take new strategic directions, while CI merely enables a company to be more successful in pursuit of a specific strategy or set of objectives. According to Biazzo and Bernandi (2003) organisational capabilities for sustainable and incremental innovation can only be developed by a number of behavioural routines (Bessant and Caffyn, 1997), such as the ability to: generate sustained involvement in continuous improvement; link continuous improvement activities to the strategic goals of the company; move continuous improvement activity across organisational boundaries; manage strategically the development of continuous improvement; articulate and demonstrate continuous improvement values; and learn through continuous improvement activity.

CI has many attractions, one of the most important being a potential low cost approach. However, Bessant and Caffyn (1997) note that despite the attractions, the technique can often fail. Successful CI requires long term organisational commitment to a course of action and the development of a consistent set of shared values or beliefs. The key to the success of continuous improvement is an ongoing process of plan (planning improvements) – do (implementing improvements) – check (whether expected performance have been achieved) – act (standardise the new practice). Among the major potential benefits of continuous improvement are: increased business performance (in terms of reduced waste, set-up time, stock, handling, breakdowns, and lead time) and 'people performance' in the form of improved development, empowerment, participation, involvement and quality of work life of employees, all of which address contemporary societal needs. The problem with continuous improvement is that the concept, which at first sight appears to be very simple and attractive, is often difficult to design, implement and develop successfully. However mature continuous improvement requires 'learning to learn', or learning to improve ever more efficiently and effectively and to tackle ever-more complex improvement problems and challenges both within and across organisational elements of supply chains (Gieskes, Hyland and Magnusson 2002).

Effective and sustainable continuous improvement of the manufacturing function requires strategic approaches within the organisation which enable managers to be able to think 'globally' about the organisational needs but act locally in response to those needs. The global issues for the organisation reflect the competitive priorities of the market. Kaye and Anderson (1999) maintain that to meet today's rapidly changing business environment, characterised by uncertainty and unpredictability businesses need competitive continuous improvement. This allows the organisation to be flexibly responsive and able to adapt their strategy quickly on the basis of feedback from customers and from benchmarking against competitors. However not all organizations have the same capacity and capabilities for improvement, some manufacturers are more mature than in others in terms of the CI capability.

As all organisations are not equal, management needs to select and develop the capabilities that best suit their needs and the needs of the organisation. In this way managers develop local tactics which flow from local conditions, which complement the local organisational capabilities yet are consistent with global needs. Managers then need to foster the development of local complementary tactics and ensure that they are integrated with the wider strategy of the company. Campbell and Alexander (1997) argue that many managers believe there is a structure and order to strategy development that should be followed. However they (Campbell and Alexander 1997) argue that tactics need to be worked out before strategy can be determined, and the strategy needs to be clear in order to define the objectives. As Mintzberg (1987) argued strategy making does not occur in isolation. Rather, strategy making is a process interwoven with all that it takes to manage an organization.

In creating strategy Campbell and Alexander (1997) argue that most of the insights important for strategy formulation reside in the heads of the operating managers and although operating managers often are not the best strategists, excluding them from strategy development means excluding their insights as well. Bhide (1986) maintains that opportunities to gain lasting advantage through major strategic moves are rare in any business. He argues that most organisations need to be vigorous and nimble and to continually improve. Many organisations are learning the limits of strategy and concentrating on tactics and execution. Kurtzman (1994) argues for the role of operations managers in strategy. He makes the point that often companies confuse manufacturing strategies with tactics. He maintains that deciding to make or buy a component is not a strategic decision rather it is tactical decision.

Previous Survey Work on CI

Results from benchmarking survey work in Australia by Chapman, Hyland, Jenkins and Sloan (1997) indicate that quality is clearly the most important competitive measure (sales-winning criteria) of manufacturing firms. This competitive priority has been effectively communicated through the organisations, and across the global manufacturing sector. Price is second only to quality but cost reduction saturates the approach of manufacturing regardless of the importance of quality or price. The factors of quality and price dominate the tactics and motivation of the surveyed companies. Dellbridge and Barton (2002) maintain that work such as this assessing the evidence of adoption of continuous improvement practices is an important area of research.

CI activities, which should be related to the broad strategies of the business, appear to be focused more on manufacturing issues of cost reduction and product quality. The range of tactics being employed at the operational level is not being integrated through the use of the competitive priorities of the business. These tactics are presumably being driven by local needs. While this may lead to the occasional lucky outcome, is more likely that it will produce local benefits, which do not gain the synergy of supporting a major strategy. The survey research undertaken previously in Australia (Chapman et al., 1997) clearly indicates that manufacturers are generally focussed on cost reduction and as a result they may never develop the foundations required to achieve sustainable performance improvement across the full manufacturing function. Also it is argued that the effectiveness of the CI program can be evaluated by the maturity of the overall process in which it operates. This level of maturity can be measured using a CI Maturity Index. This Index has been developed by Bessant and Caffyn (1997). As companies develop more advanced levels of maturity in the CI process, differing characteristics will be evident.

In the work of Gieskes et al (2000) they maintain that CI innovators in Australia on average have nearly two years more experience compared to their European counterparts. They argue that this suggests that CI was introduced in Australia before it was in Europe and a possible explanation could be Australia's geographical vicinity to the Southeast Asia region and Japan. So it may be the case that some Australian manufacturers are further along the CI journey and are using more sophisticated tools and techniques and are better placed to benefit from CI. It may, however, be the case that early adopters in Australia have successfully used basic tools and techniques and having gained significant performance improvements from these techniques have stuck with proven methods. If this is the case then it could be expected that they have not used the 7new quality tools or Six Sigma as much as the European firms. Also in Gieskes et al (2000) their survey showed that the more advanced companies generally attach more importance to sophisticated CI tools. One apparent anomaly is that early adopters perceive the importance of problem solving tools to be higher than innovators. Another result was that the more mature a company is, the

more it uses problem solving tools, especially the seven 'old' tools, seven 'new' management tools and creativity tools/idea generation tools. This was consistent with the observation that in advanced companies more personnel have been trained in problem solving tools. Underlying most of the differences that were found by Gieskes et al (2000)is the closer proximity to Japan for Australian companies and their consequently greater exposure to Japanese competitors. This proximity they suggest would also be expected to have a greater impact on the national culture in Australia than in the European nations. They also suggested that Australian companies started much earlier with the adoption of CI than European companies. This earlier start by Australian companies could well be due to their earlier and more serious exposure to Japanese competition as well as the natural orientation of Australia towards Southeast Asia.

Methodology

The survey (n=298) being reported is a sub-set of an international investigation of CI in Europe and Australia. A total of 209 surveys were received from European organizations. The European countries included: Ireland (n=21), Italy (n=60), The Netherlands (n=51) and Sweden (n=77). The Australian sample consisted of 89 organizations located on the eastern seaboard. This initial analysis considers European firms as a single unit although there may be significant differences between European countries such as Italian and Swedish firms; this exploratory analysis seeks to build on previous studies such as that of Gieskes et al (2000)

Each firm was mailed a survey explaining the purpose of the study. This paper will report on the international comparison concerning the importance and usage of CI tools (18 items), incentives to support CI activity (5 items) and the importance and usage of problem finding and solving tools (13 items). Importance was assessed on a five point scale (important, to unimportant). Usage was also assessed on a five point scale (very frequently to rarely). Lower scores for 'importance' suggest the item is more important and lower scores for 'usage' suggest the item is more frequently used. The responses were coded 1 to 5 and means were calculated for each item. While there is some debate about the validity of calculating the means from such responses these mean provide a useful indication of the central tendency of respondents replies.

Data Analysis Strategy

Mean differences on each item between Australia and European organizations were calculated using multivariate analysis of variance. Correlations were also computed for each item across both samples to assess the degree of association between importance and usage.

Results

'Support from managerial staff' was considered the most important CI tool in Australia and Europe. In general, Australian organizations rated a number of CI tools as more important and indicated they were more frequently used than European organizations. Tools such as 'supportive leadership', 'promotion through internal media' and 'formal policy deployment' were considered significantly more important by Australian organizations. A number of tools were also found to be more significantly used in Australian organizations. These included: 'face-to-face communication', 'support from managerial staff' and 'supportive leadership'. Correlations between importance and usage were computed for each variable. The highest correlation (0.68) was for 'promotion through internal media' and the lowest (0.19) was for 'support from managerial staff'. Complete details can be found in table 1.

Table 1 Mean importance and use of tools for accomplishing improvement activities

	Importance*			Use			
Tools	**Aus**	**Eu**	**F**	**Aus**	**Eu**	**F**	**r****
Use of slogans	3.72	3.73		**3.73**	**4.12**	6.04	0.53
Training of personnel in problem solving tools	1.94	2.03		**2.82**	**3.31**	11.10	0.37
Monitoring the improvement activities	1.52	1.55		2.32	2.60		0.43
Support from managerial staff	1.31	1.49		**2.20**	**2.57**	6.59	0.19
Incentive systems	2.99	2.76		3.57	3.63		0.42
Supportive leadership	**1.52**	**1.94**	12.47	**2.30**	**2.90**	18.08	0.48
Work in teams/work groups	1.91	1.85		2.47	2.51		0.54
A suggestion scheme	3.15	2.92		3.82	3.53		0.58
A general problem solving format (e.g. PDCA-cycle)	2.44	2.21		3.22	3.31		0.52
Promotion on notice boards	2.75	2.98		3.31	3.47		0.63
Promotion through internal media	**2.80**	**3.26**	8.04	**3.22**	**3.79**	11.35	0.68
Promotion through competitions and awards	3.43	3.68		**4.04**	**4.35**	5.05	0.59
Face-to-face communication	**1.58**	**1.83**	4.93	**2.14**	**2.45**	4.99	0.47
Regular shop floor visits by management	1.62	1.71		2.38	2.58		0.30
Use of ISO 9000 / 2000, or any other quality standard	1.86	2.03		1.86	2.03		0.60
Use of Total Productive Maintenance	2.59	2.56		3.43	3.53		0.48
Quality awards (e.g. Baldrige)	3.42	3.40		4.12	4.23		0.58
Formal policy deployment	**2.27**	**2.77**	10.32	**2.72**	**3.57**	26.60	0.63

* Bold numbers reflect significant difference at $p < 0.05$

** Correlation between 'importance' and 'usage' across both samples. All correlations were significant at $p < 0.01$

The importance of incentive strategies to support CI activity are shown in table 2. Australian organizations were more likely to rate all incentives as more important and in particular, a significant difference was found for using 'career development as a reward for improvement results'. Australian organizations also made more frequent use of rewarding improvement results via career development and salary. The highest correlation (0.55) across both samples was rewarding improvement results via salary.

Table 2 Mean importance and use of incentive strategies for accomplishing improvement activities

	Importance*			**Use**			
Incentive strategies	**Aust.**	**Europe**	**F**	**Aust.**	**Europe**	**F**	**r****
Suggestions are evaluated and rewarded	2.60	2.68		3.78	3.71		0.47
Improvement results are rewarded directly through one off bonuses	3.16	3.07		4.06	3.96		0.47
Improvement results are rewarded indirectly through individual salaries	2.82	3.04		**3.38**	**3.84**	8.72	0.55
Improvement results are not rewarded monetarily, but through development of individual jobs, careers etc.	**2.38**	**2.70**	5.36	**3.09**	**3.52**	8.19	0.44
Improvement results are rewarded to entire teams	2.61	2.63		3.67	3.80		0.45

* Bold numbers reflect significant difference at $p < 0.05$

** Correlation between 'importance' and 'usage' across both samples. All correlations were significant at $p < 0.01$

The two main data analysis tools were 'problem identification' and 'process mapping" respectively in both samples. The only significant difference was that Europe considered the use of 5S as more important. There were no significant differences for frequency of use. However, the most frequently used tools were 'problem identification' and 'process mapping" respectively in both samples. The highest correlation (0.70) was for 'process mapping'. The details for each item can be found in table 3.

Table 3 Mean importance and use of problem finding and solving tools

	Importance*			**Use**			
Measurement and data analysis tools	**Aust.**	**Europe**	**F**	**Aust.**	**Europe**	**F**	**r****
Problem identification tools/checklists	2.06	2.06		2.64	2.72		0.64
7 basic quality tools eg. Pareto, fishbone	2.64	2.58		3.47	3.53		0.66
7 "new" quality tools (7MP tools) i.e., Affinity diagrams	3.28	3.11		4.33	4.25		0.50

Process mapping tools	2.46	2.36		2.97	3.03	0.70
FMEA (Failure Mode and Effect Analysis)	2.92	2.69		3.79	3.55	0.69
QFD (Quality Function Deployment)	3.39	3.15		4.16	4.17	0.59
Creativity tools/Idea generation tools	2.93	3.02		3.79	4.05	0.56
Display/Visualisation tools	2.58	2.67		3.36	3.58	0.55
Standardisation tools	2.71	2.67		3.39	3.54	0.55
5S (cleaning, sorting, systematising, etc.)	**3.17**	**2.72**	6.19	3.96	3.80	0.60
Simulation	3.17	3.28		3.89	4.05	0.66
Six Sigma	3.17	3.34		4.11	4.28	0.58
SPC – Statistical Process Control	2.60	2.68		3.26	3.51	0.73

* Bold numbers reflect significant difference at $p < 0.05$

** Correlation between 'importance' and 'usage' across both samples. All correlations were significant at $p < 0.01$

Conclusion

Country-specific factors do not have much impact on CI practices and performance. Apart from some specific aspects, the countries involved generally have similar CI processes and are in comparable stages of development. The finding that country-specific factors have only limited influence is somewhat surprising as anecdotal evidence suggests that differences in culture, industry composition, economic situation and regulatory structures would create considerable differences in, for example, reward systems and the organisation of CI. The areas that do show some significant differences are in the use of tools for accomplishing improvement activities. In this area supportive leadership, face-to-face communication, promotion through internal media and formal policy deployment were also significantly more important in Australian firms than in European firms. The first two variables supportive leadership and face-to-face communication are particularly interesting and may be indicative of the movement way from an adversarial approach to managing change and work organisation. It may also be the case as Gieskes et al (2000) suggested in their study that Australian firms have a more diverse workforce from many different ethnic backgrounds and this means face to face communication and leaders who understand such diversity are important in managing any change such as CI.

In the two other areas incentive and strategies for accomplishing improvement activities and problem finding and solving tools there was a more consistent approach between Europe and Australia. Australian firms rated the use of improvement results rewarded indirectly through individual salaries to be of greater importance when compared to Europeans. In the case of improvement results not being rewarded monetarily, but through development of individual jobs, careers etc. While neither group rated them as critically important Australian firms rated them as more important than European firms and Australian

firms made more significant use of this incentive practice. When examining the importance and use of problem finding and solving tools the only tools that were significantly different were the 5S (cleaning, sorting, systematising, etc.) and interestingly these tools were amongst the few European firms rated more highly than Australian firms. The tools rated the least used by both Australian and European firms were Six Sigma and 7 "new" quality tools (7MP tools i.e., Affinity diagrams), it appears most firms in this study are sticking to the tried and true tools that delivery performance improvements and that workers on the factory floor can use and understand.

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