Editorial

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This special issue of the *International Journal of Technology Management* contains a selection of papers first presented at the 2nd international conference organized under the auspices of the European Continuous Improvement Network (EuroCINet). Since 1994, when it started as a EUREKA project (EU 1222), the EuroCINet has developed into an intensive collaboration between academic and industrial partners in Europe and Australia who share an interest in Continuous Improvement (CI), that is, 'the planned, organized and systematic process of ongoing, incremental and company-wide change of existing practices aimed at improving company performance' [1]. The academic partners currently involved in the network are Aalborg University (Denmark), Brighton University, (UK), Chalmers University of Technology (Sweden), Helsinki University of Technology (Finland), Politecnico di Milano (Italy), SINTEF (Norway), Trinity College (Ireland), Twente University (The Netherlands), and the University of Western Sydney (Australia). Recognizing changes in industrial needs and scientific interest as well as growing interest and participation in the network's activities from partners outside Europe, the network recently decided to drop the prefix 'Euro' and to broaden up its focus, to become the Continuous Innovation Network (CINet).

Why a special issue of the *International Journal of Technology Management* on Continuous Improvement? For two reasons, basically.

First, perhaps, to establish a tradition. The 1st International EuroCINet conference held in Gatwick in December 1996 provided the basis for a special issue of this journal, Vol. 14, No.1, which was guest edited by John Bessant. The present issue contains a selection of papers presented at the 2nd International EuroCINet conference on *Continuous Improvement: From Idea to Reality*, which was hosted by Twente University, Enschede, The Netherlands, 14–15 September 1998.

The second reason is much more fundamental and related to our view of technology. There are about as many definitions of technology as there are authors concerned with technology management. We prefer to regard technology from a knowledge point of view. The history of technology development shows that knowledge developed by people, after having resided in the human mind and body in the form of knowledge, experience, skills, always finds its way to application in software, i.e., methods, techniques, approaches, and/or hardware, for example tools, equipment, plant. In other words, technology is knowledge embodied in people ('humanware'), software and

hardware. Technology management, then, is the management of developing, implementing, organizing, operating, and incrementally improving/radically changing, the configurations of 'humanware', software and hardware that companies need to perform their various different activities effectively.

In that sense, Continuous Improvement has become an important technology for all kinds of organizations. Examples of CI hardware include so-called *poka yoke* or failure proof devices. There is a wealth of software applications, ranging from simple checklists, through analytical and problem-solving tools, to much more advanced methods like Quality Function Deployment, and computer-supported tools like CUTE [2] and software versions of the EFQM model. However, perhaps most of all it is the 'humanware' component that makes the difference: learning, team-working, communication and many other 'social' skills, in addition to the capabilities to use an ever wider range of software and hardware technologies like the ones mentioned before, and many others. CI seems a simple concept, but it is in fact very complex to develop, implement, organize, operate, and incrementally improve or even radically change, a configuration of underlying technologies that suits the company's situation best.

This may also explain, at least partially, why CI is still more an art than a theory [3,4], although early accounts go back to before the industrial revolution even started and Scientific Management was developed in an attempt to organize and manage industrial activity in a more business-like manner. Most publications on the subject are what could be called attention literature, in which the importance of Continuous Improvement is stressed and general prescriptive conditions for successful CI are presented (e.g., [5–10]). A second type of literature is descriptive literature. Examples of this category are publications describing CI tools, techniques and practices, and their application (e.g. [5,11]) or diffusion [1,11]. A third and currently still relatively rare type of publication aims to contribute to the development of *CI theory*. This literature attempts to categorize empirical observations and to uncover the mechanisms and rules explaining empirical reality (e.g., [1,3,4,11–14]).

The main criterion used to select the papers contained in this special issue was their contribution to the development of CI theory. At the same time, this selection is fairly representative of the field as it is, which we are tempted to call pre-paradigmatic. This means that there is no real consensus about what are the key issues (everything seems equally important), and also a lack of a methodological consensus (every good method is allowed). At the same time, however, the levels of liberalism, in the good sense of the word, and mutual appreciation, are high, and there is no sign whatsoever of the 'debate between the deaf' representatives of competing paradigms so characteristic of many, more mature, disciplines. Indeed, the issues addressed in this paper range widely, from learning, through the use of suggestion schemes and the involvement of shop floor teams, to the impact of national culture. The range of research methodologies employed is equally wide. A multiple case study, a comparison of previous investigations based on postal surveys and multiple interviews, a longitudinal field experiment, action research, survey-based research, and comparative case studies: it seems that the whole methodological toolbox is accepted by the CI community. It is not clear at this stage whether this is right or wrong, a sign of the times or something to stay. What is clear, though, is that all papers are based on well-designed research and each of them, in its own way, presents a valuable contribution to the development of CI theory.

If anything, CI is a learning process. The central theme of the article by Paul Coughlan and Andy Harbison of Trinity College, the University of Dublin, and Tony

Dromgoole and Dermott Duff, of the Irish Management Institute, is the need for both managers and organizations to learn – that is, to improve – at a rate faster than their environment is changing. Based on this, the authors developed an action research initiative with the objectives

1 to facilitate continuous improvement of operations practice and performance through collaborative action learning in a small number of firms, and

2 to develop an approach of a contingent nature to address this need, which could be replicable both in Ireland and throughout Europe.

The paper describes the movement of five Irish firms towards World Class Operations and Performance, and uses a case study of one of the firms to illustrate this. Central to the approach developed is the frequent and *integrated* use of self-assessment; presentation on progress; feedback, coaching and consulting received from peer companies and researchers involved; inputs in the form of presentations, reading material and company visits. Furthermore, these activities are anchored in the real concerns of the companies, and the actions and decisions that are being taken by the companies in real time, underscoring the degree of control the participants have over the content and pace of the program.

Learning is also the central theme of the contribution by Frank Gertsen of Aalborg University. The objectives of his paper are to describe:

1 how experience with CI relates to the context, practices and outcomes of CI, and

2 what theoretical and managerial lessons can be learned about the path of evolution towards CI.

The paper is based on a survey of 87 manufacturing firms in Denmark and the results clearly show that CI does make a difference, in terms of HRM style, decentralization, participation, training, management commitment, reward systems and the use of supportive methods and tools, and also in terms of contribution to performance improvement. The latter is especially interesting, as it has been generally *believed* that CI contributes to performance improvement, but this paper is one of the few really 'proving' this. Furthermore, the paper shows that, in fact, the contribution of CI to performance improvement follows a U-shaped pattern. That is, both inexperienced starters *and* mature CI companies benefit from CI, whereas companies halfway through the learning curve are much less successful. Possibly, the double loop learning (learning new and improving existing practices) at this stage goes at the expense of single loop learning (improving performance). Obviously this is a critical stage in the development of companies towards full-blown CI and a stage requiring quite some perseverance (and, although we hate to say so, also a bit of belief) of the organization to continue investing in CI capability in spite of a stagnating or perhaps even falling rate of performance improvement.

While learning is a central theme in Continuous Improvement, two other recurring themes are the role of leadership and the impact of action routines. Maria Olsson and Johan Wass, both of Chalmers University, Gothenburg, have combined these themes in their contribution to the present special issue. Taking two separate quantitative, i.e. survey-based, studies, on best practice manufacturing and best practice product development, respectively, as the basis for their analysis, they address the question

whether there is a consistent difference in leadership style and action routines between the two samples. In other words:

1 is there a difference in leadership style and action routines between the two samples, and

2 is there homogeneity within each sample regarding those two aspects of behaviour: are there two separate populations, or not?

Their answer is: yes, even though the two populations are converging, to the extent that manufacturing is becoming more complex, while the complexity of product development is reducing, there are (still) consistent and statistically significant differences between the two samples, and yes, there are two separate populations. Interestingly, however, the internal homogeneity of the two populations is higher for the action routines than for the leadership styles. In other words, the action routines seem to follow the nature of the task performed, while the link between task characteristics and leadership style is much weaker. The authors could not find a satisfactory explanation for that and propose that further research be performed in this particular area.

The paper by Ellen Ros and Harry Boer of Twente University is based on longitudinal case studies of the functioning of six shop floor level improvement teams in two companies. In total 15 major and 60 smaller improvement processes were studied, one of which is presented to illustrate some of the mechanisms playing a role in improvement teams. The hypothesis underlying the research was that differences between the teams' day-to-day operational tasks and characteristics of CI activities would cause problems as regards the effectiveness of the latter. The research confirms this only partially. The authors explain this with reference to a couple of factors, in particular slack (team members appeared to have more experience and skills than they actually need for their operational tasks), the selection of improvement problems (the teams tended to choose only those problems that they expected to be able to resolve themselves) and the role of the coaches (who compensated for lack of knowledge and various kinds of skills). However, these factors could not compensate for all the differences, so quite a few problems remained, which indeed seem to be related to the differences between operational and improvement activities. Usually, operational processes are much more routine than improvement processes and this requires much more communication between team members and between the team and its coach, line and staff functions than the team and their membership are used to and, consequently, capable of, at least initially. Poor communication has a direct impact on the speed and quality of improvement initiatives, but also a negative impact on motivation, which bears consequences for the sustainability of CI in the longer run. Another factor affecting the contribution of teams to CI is the employees' perception that the analysis of problems and (the impact of) solutions is not 'real work'. So, although much goes unexpectedly well, due to factors compensating for the differences between operations and continuous improvement, these same differences also cause many problems. Yet, the authors conclude their contribution in a positive mode, writing that, "in spite of the many problems improvement teams may run into, their contribution may still be very important".

The earliest accounts of CI-related concepts go back at least as far as the 18th century [15]. One of the earliest recorded examples of the implementation of CI practices is the suggestion box implemented by the 8th shogun, Yoshimune Tokugawa, in Japan, 1721. A British example is the scheme started in 1871 by Denny of Dumbarton, a Scottish

shipbuilder who claimed that it was the first industrial system to invite and award 'any change by which work is rendered either superior in quality or more economical in cost'. In order to unleash what he called 'the hundred-headed brain', John H. Patterson, founder and CEO of the American National Cash Register Company (NCR), started a suggestion, award and training system, around 1894. Other examples include the gradual implementation of an 'incentive management system' at Lincoln Electric Company, started in 1915 and refined over the subsequent decades (!), and a suggestion box system based on NCR's system, at Kanebuchi Boseki, a Japanese textile firm, implemented in 1905. Suggestion schemes are still used in many companies but, compared to the Japanese experience, their effectiveness in Western countries is low. Roel Schuring of Twente University and Harald Luijten of Fokker Special Products report an experiment to increase the effectiveness of a suggestion scheme at Fokker Special Products by deliberately applying the principles of *kaizen* and performance management. These theories provided new design rules, and the suggestion system designed using these rules differs from traditional ones in several ways. In order to test the system and, through that, the validity of the design rules, the authors conducted a longitudinal field experiment. This led them to the following conclusions. First, the theories behind *kaizen* and performance management fit nicely together, in spite of their apparent differences, and may benefit from, and add to, each other. Second, the synergistic use of both theories did indeed result in a suggestion system that is significantly better in terms of number of suggestions per employee, the quality of the suggestions, and the time it takes to develop and implement an improvement after it was first suggested.

While the other five papers in this issue are based on national studies performed in Ireland, The Netherlands (two), Denmark and Sweden, Riitta Smeds of Helsinki University of Technology, Paola Olivari of Politecnico di Milano and Mariano Corso of the University of Pisa, take a cross-national perspective. Their paper focuses on the influence of national culture – in particular Finnish, Italian, German and Swedish culture – on inter-project learning in New Product Development within one multinational company, Ericsson. The paper is based on case studies. Although this methodology does not allow for broad generalizations, the research bears some interesting implications. Albeit at first sight trivial, the studies suggest that culture does make a difference but, and this is less trivial, it does not necessarily act as a constraint. On the contrary, culture can be used deliberately, especially in international, networked R&D organizations like Ericsson's, to develop effective portfolios of learning mechanisms, and to disseminate and locally adapt elements of that, as part of their global learning strategy.

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