An evolutionary model of continuous improvement behaviour

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Abstract

In today's complex and turbulent environments the need for continuous improvements in products and processes is widely recognised. But the mechanisms whereby such a continual stream of innovation can be achieved are often less clearly identified. One option is to mobilise a high proportion of the workforce in a process of sustained incremental problem-solving, but experience with this approach suggests that successfully doing so is far from simple. Although many programmes for 'kaizen' or 'continuous improvement' based on employee involvement are started, the failure rate is high. This paper reports on extensive case-study based research exploring how high involvement in continuous improvement can be built and sustained as an organisational capability. It argues that this phenomenon needs to be viewed as a cluster of behavioural changes which establish innovation routines in the enterprise, and presents a reference model for assessment of progress in the evolution of such capability. © 2000 Elsevier Science Ltd. All rights reserved.

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1. Resource based strategy

Much current thinking on strategy concerns what is often termed the 'resource-based' model, in which competitive advantage is seen as coming from the particular bundle of tangible and intangible assets to which a firm has access (Kay, 1993; Teece and Pisano, 1994). Accumulating these assets is seen as a key task in strategic management, and the 'core competence' of the enterprise is essentially the outcome of this process (Pavitt, 1990; Prahalad and Hamel, 1994). The more firm-specific and difficult to copy these resources are, the more likely it is that sustainable competitive advantage can be built and maintained.

Resources come in various shapes and sizes but can be grouped into tangible assets — buildings, plant, equipment, etc. — and intangible assets. This latter group is made up of knowledge assets — what an enterprise knows about (its core technologies, its market knowledge, etc.) — and behavioural patterns — how it organises and operates. The important feature here is

that, unlike tangible assets, they are difficult to acquire and copy because they are often the product of extended learning processes. This makes them highly firm specific and a much stronger source of potential competitive (Teece, 1998). As a UK manager put it, "…there is no other source of competitive advantage! Others can copy our investment, technology and scale — but NOT the quality of our people…"[1]

In other words, what makes a firm competitive is not so much the equipment, location, buildings, etc. which it possesses (since anyone with deep enough pockets can duplicate this resource position) but what it knows about and how it behaves. A firm like 3M owes its competitive position to deep *knowledge* (around the fields of coatings and related technologies) which it has built up over nearly a century and to *ways of working* which are particular to the organisation (such as the encouragement of 'bootlegging') which give it the ability to introduce new products on a sustained basis. Both these sets of attributes — the knowledge base and the behaviour patterns — the 'culture' or 'way we do things around

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[1] Managing Director, British Chrome and Steel, cited in 'Partnerships with people', Department of Trade and Industry, London, 1998.

here' — are specific to the company and cannot easily be duplicated.

One of the strongest barriers to imitation is that much of this asset base is a mixture of formal and tacit elements. Although 3M has formal codified knowledge in the form of patents, process designs, etc., much of what it knows is tacit knowledge, held in the experience and 'fingertips' of its employees. In similar fashion although some of its behaviour patterns are formalised into structures and procedures, much of 'the way we do things around here' is essentially tacit, a shared understanding about norms of behaviour and underlying values which have evolved over time.

This paper is concerned with such behaviour patterns and with how particular patterns can confer competitive advantage. They are often described in the literature as 'routines' and there is growing interest in this approach as a way of understanding organisational behaviour. Winter, for example, defines routines as "…a relatively complex pattern of behaviour…triggered by a relatively small number of initiating signals or choices and functioning as a recognisable unit in a relatively automatic fashion…" (Winter, 1986). This is not to say that routines are mindless patterns; as Giddens points out "…the routinised character of most social activity is something that has to be 'worked at' continually by those who sustain it in their day-to-day conduct…" It is rather the case that they have become internalised to the point of being unconscious or autonomous (Giddens, 1984).

Tranfield et al suggest that three sets of routines are important — those concerned with maintaining performance of current processes, those concerned with improving existing processes and those concerned with transforming or changing to new processes. In this article we are concerned with the middle option — routines for incremental innovation, for, 'doing what we do better'. (As we shall see, there is scope for employing such routines to help with more radical innovation but extended discussion of this lies outside the scope of this paper).

Our focus is on the ways in which such behavioural patterns can be built up across organisations to provide operational and eventually strategic advantage through high and regular involvement in the innovation process.

2. Routines for continuous improvement

The idea of high involvement in incremental innovation is not new. It is based on the premise that all human beings are capable of creative problem-solving activity (although, as Kirton points out, their preferred behavioural styles may not always lean towards radical expression of such innovative behaviour) (Kirton, 1980). There are many historical examples of encouraging participation in innovative activity — for example, Schroeder and Robinson report on Denny's shipyard in Dum-

barton in the 18…and on experiences in trying to employ the 'hundred-headed brain' at NCR around the turn of the century (Schroeder and Robinson, 1991).

More recent discussion has been strongly influenced by experience in Japan of what is often termed 'kaizen' and which has generally been translated in Western parlance as 'continuous improvement' (CI) (Imai, 1987). Although strongly associated with the 'quality movement' of the 1980s, CI as a concept has roots in many other fields, including Socio-technical systems design, the human relations movement and, more recently, the discussion surrounding 'lean manufacturing'. (Lewin, 1947; Miller and Rice, 1967; Womack and Jones, 1997).

There is considerable and unhelpful confusion in the way the term 'continuous improvement' is used, since it is deployed both as a verb — the process whereby a continuous stream of innovations emerge — and also as a noun, referring to the outcome of that process. Here we are concerned with the latter and particular with looking at CI as a particular bundle of routines which can help an organisation improve what it currently does.

It can be argued that much of the literature surrounding CI does not treat the behavioural aspects of the process well. In particular three major criticisms can be levelled:

- it is often prescriptive and fails to cover implementation
- when it does explore implementation — how to introduce CI — it tends to assume a correlation between exposure to tools (such as the seven quality management tools[2] and CI — and neglects the other elements of behavior building
- it assumes a binary split between having or not having CI, rather than seeing it as an emerging and learned pattern of behaviour which evolves over time.

We suggest that the experience of disappointment and failure with CI programmes reported by many organisations (EIU, 1992) derives in large measure from a lack of understanding of the behavioural dimension. In the following sections we report on a model for understanding and building CI which is based on the concept of development of routines, and the evolution of a strategic capability through this process.

3. The CIRCA project

This paper draws on research into CI behaviours under the CIRCA programme — Continuous Improvement

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[2] There are many tools available to support quality improvement but, following Ishikawa, seven have been highighted as a basic set with which to work on problem-finidng and solving. These are: cause and effect diagram, scatter diagram, Pareto analysis.

Research for Competitive Advantage — which aimed to deliver a basic methodology for implementing and maintaining CI and a toolbox of resources to support this (Bessant et al., 1992). The research design had two elements:

- action research on particular CI problem issues within a core group of companies (including both large and experienced CI users and SME users, beginning implementation for the first time)
- experience sharing and development of the CI field through a wider network of companies

The core research led to the development of a model and a series of guidelines for 'good practice' in design and implementation of CI systems which were then tested and refined via the network. Originally the plan for the network was to offer access to these research results to a wider community via a series of dissemination workshops, but it has evolved into a much more extensive system for experience sharing (Bessant and Tsekouras, 1997). Membership grew from a planned group of 20 firms to over 70 organisations participating in some aspect of the Network's activities. Of these the majority are in manufacturing and although some large firms maintain an involvement, the network caters primarily for SME users. A detailed review of the Network can be found in (Bessant, 1995).

Through the core research and access to firms in the network, the programme was able to develop case studies of over 100 organisations. Table 1 provides outline details on the structure of this sample.

It should be stressed that the primary objective in each case was to explore the experience of implementing CI and data was collected around the following basic themes:

- Background data characterising the organisation and its products, markets, etc.
- History of CI, especially reconstructing the process

of evolution (including any stops, false starts, and stalling points).
- Performance measures, both in terms of the level of CI activity (how many suggestions, how much involvement, etc.) and in terms of impact on the business (at local and strategic level)
- Practice measures, exploring the extent to which CI behaviours were in place and had become 'routinised'
- Key blocks and barriers to maintaining or developing CI
- Key enablers facilitating progress

In addition to the case studies a survey of 142 UK firms was carried out in conjunction with 'Works Management' magazine as part of a wider European review of CI experience. A detailed discussion of the findings can be found in (Caffyn et al., 1996).

Two criticisms can be made of the methodology used. In the first place the extended nature of the research meant that the model frameworks used to shape the interview questions were less developed in the early stages than later in the work. (The evolution of the model development is described in Caffyn, 1998) Second the work focussed on intra-firm behaviours and so far the influence of product/market or of firm size has not been fully explored.

Despite these limitations, it was possible to detect several common themes which ran through the case studies. In particular content analysis and comparison of the cases suggested that:

- CI involves a suite of behaviours which evolve over time (rather than a single activity)
- These behaviours cluster around several core themes — for example, behaviours associated with systematic finding and solving of problems, behaviours associated with monitoring and measuring processes, behaviours involving strategic targetting of CI, etc.
- These clusters — routines — evolve and are

Table 1
Main characteristics of the case study research sample. Total sample size=103 organisations

Characteristic	Number of organisations	Case study	Longitudinal study
(1) Sector:			
manufacturing	86	52	34
service	15	10	5
Public sector	2	2	
(2) Size:			
Small 1-50 employees	13	7	6
Medium 51-250	33	23	10
Large 251+ employees	57	42	15
(3) UK based	80	41	39
Non-UK	23	23	

reinforced over time. They can be observed directly, and their presence can also be inferred by looking at behavioural 'artifacts' (Schein) such as structures, procedures or symbols in the organisation

- There appears to be a correlation between performance — level of CI activity and its impact on organisational problems — and the extent of development of these routines.
- Developing routines involves two kinds of learning — improving and reinforcing behaviours within a particular routine cluster and adding new routines to the repertoire
- Every organisation trying to implement CI is aiming at establishing the same patterns of behaviour but there is widespread variation in the context within which they are doing so. Thus we are proposing a generic model of behaviour modulated by individual firm contingencies
- In similar fashion the blocks and barriers to effective development of these behaviours and the ways of enabling their evolution have a generic and a contingent nature. (For example, most firms make use of some form of reward/recognition system to help reinforce CI behavior, but the specific variant used will vary between firms).
- Although the development of CI involves a behavioural learning process which takes place over time, there is no correlation between length of time and degree of success. Rather the key variable seems to be the amount of management effort put in to build and maintain the CI behaviour patterns.

The CIRCA research is located in what can be called the 'action research' approach which is characterised by intensive interaction with subject organisations (Clark, 1970). In this way the behavioural view outlined above has been built into a proposed model framework which is now being used as the basis for diagnostic and behaviour modelling work within these organisations. The results reported here represent a 'work-in-progress' view of a model which is being tested and refined through further research.

4. Evolving routines for CI

Following Nelson and Winter and others, we see routines as clusters of behaviour which have become embedded in the organisation and which represent 'the way we do things around here' (Nelson and Winter, 1982).

Such patterns belong to what Schein terms 'organisational culture' and are formed as part of a complex, multi-level process in which underlying beliefs and values become enacted in particular behaviours which in turn generate artifacts which reinforce the beliefs and

behaviours (Schein, 1984). Over time the 'way we do things around here' becomes explicit in symbols, structures and procedures in the organisation which in turn reinforce the underlying behavioural norms.

Viewed in this way the problem of 'culture change' becomes clearer. In order to introduce a new pattern of behaviour — to change or add routines — there has to be a process of articulation and reinforcement of the behaviour, and this cycle needs to be repeated frequently and for long enough for the new pattern to take root. It can be influenced by the use of structures and procedures which support its development — but equally, can be inhibited if existing structures and procedures are incongruent with it. In short it is a lengthy learning process.

The problem becomes further complicated if we consider that the issue may not only be one of adding new routines but also of losing old and now inappropriate ones. For example, underlying the principle of CI is a belief that all individuals can make a contribution to problem-solving innovation within the firm. But most organisations have been operating on beliefs, originating in the 'scientific management' approaches developed at the turn of the century, which sees a split into 'thinkers' and 'doers' and which implicitly opposes the CI values. For any lasting behaviour change to take place towards CI, efforts are needed to 'unlearn' the existing Tayloristic routines.

Far from being a single binary characteristic (either you have it or you don't), our research suggest that it is possible to identify an evolutionary pattern of development in which nine sets of routines are involved.

As we will see in the next section, organisations can and do develop these clusters to different levels, and some are more critical than others at different stages in developing the overall capability of CI.

5. A maturity model for the evolution of CI capability

We argued above that building and embedding routines is an extended learning process, and involves a process of gradual accumulation. We suggest the progress is from individual behaviours to routines which constitute particular abilities within the firm — for example, the ability to find and solve problems systematically or the ability to share knowledge across boundaries. In turn these abilities converge and accumulate to the point where the organisation is able to deploy a strategic capability in CI.

An analogy can be drawn with a virtuoso musician who has the overall capability of entertaining and captivating an audience. This derives from a set of constituent abilities — for example, the ability to play the instrument technically, to interpret compositions in an emotionally rich way, to 'read' the audience and react

to their responses, to entertain through gestures and on-stage behaviour, etc. Below this are some basic (but nonetheless learned) behaviours which function in relatively autonomous fashion — reading the notes on the page, making the mechanical movements to play the instrument, getting dressed for and appearing on time for the concert, etc.

An important mechanism whereby these behaviours become automatic is that of practice, rehearsing every day until they become second nature. We also need to recognise that some behaviours must be learned earlier than others — for example, interpretation behaviour is of little use until the more fundamental behaviours associated with playing the instrument are mastered.

Table 2 lists the key routines associated with CI and their constituent behaviours.

5.1. Stages on the journey

CI abilities include problem-solving skills, active participation, how improvement activities are linked to strategic goals and mechanisms for transforming learning across the entire organisation. Obviously, not all organisations have equal CI abilities. Some firms are competent at identifying problems or have used cross-divisional teamwork for years while other firms have never considered any of these issues to be important or are only just starting out with them.

Our model suggests that there are different levels of development of CI abilities. Moving between levels represents the process of first learning, then practising and then mastering the behaviours which make up that particular ability.

Classifying these abilities can help firms understand where they stand in relation to other companies and how they can develop a plan to expand their own CI abilities. In practice we have identified a number of stages on the journey, associated with a particular level of development of CI routines and abilities. These are described in Table 3 below.

It is important to recognise that these represent generic 'archetypes'. Each organisation's experience will be specific to them but their development of CI capability will have to pass through these common stages. Progression from one stage to the next involves both maturing of particular routines (and their constituent behaviours) and also adding new routines to the core set.

The value of such a model is that it provides a basic 'road map' for the journey towards development of CI capability. By reviewing the experience of many different organisations travelling on the same road and through the same stages we can begin to detect patterns in the likely obstacles and pitfalls which they might encounter, and in the strategies which they use to deal with them.

Before we move on to explore the potential use of this approach as a model for organisational development, it will be worth reviewing some cases which look at CI development in terms of the development of behavioural routines and abilities.

6. Some case examples

Case (a) involves a motor components manufacturer involved in supplying various items of trim made from moulded plastics. They employ around 700 people on several sites and have recently been confronted with a strong challenge for performance improvement from major customers. Faced with the need to offer significantly higher and more consistent quality levels and a cost reduction of the order of 10%, they have begun looking at CI as one of several possible strategies for dealing with the emergent crisis. Whilst there is a general awareness that other firms have been able to obtain benefits through CI, the company is not clear how this is being done. Some improvements have been achieved through changes in layout and flow, and the shift to a 'pull' system, but these were instituted by a group of external consultants whose brief did not extend to workforce involvement. Responsibility for CI has been given to the Human Resources director who has instituted a 1-day training programme for all staff which introduces the basic concept of CI and some simple tools. Results so far have been patchy; whilst there is enthusiasm amongst some staff, there is also scepticism from others, many of whom see this as 'one more initiative'. Benefits follow a similar pattern; in a few areas there have been useful and interesting ideas which have led to tangible improvements but in other areas little has changed.

Case (b) is a manufacturer of high quality speakers and accessories for the consumer hi-fi market. It has a strong position in design but has recently been paying close attention to improving its manufacturing operations. As part of a move towards cellular manufacturing and improved production flow, they are working to try and develop a teamwork approach. CI is seen as an important element in this, and the company has been heavily influenced by examples of problem-solving groups which they have seen in other firms as part of a programme of visits which they recently undertook. Implementation so far has consisted of some basic training in problem-solving tools and the introduction of an area on the shop floor where staff are encouraged to meet and suggest improvements during discussions around a white board.

Both of these companies are clearly interested in CI and have begun to try and change behaviour within the organisation to deliver it. But these attempts are limited in scope and lack systematic application; they are typical of level 1 in the above stage model. CI is not well understood and is being introduced in a piecemeal and random

Table 2
Key routines associated with CI and thier constituent behaviours

Ability	Constituent behaviours
'Understanding CI' - the ability to articulate the basic values of CI	•people at all levels demonstrate a shared belief in the value of small steps and that everyone can contribute, by themselves being actively involved in making and recognising incremental improvements. •when something goes wrong the natural reaction of people at all levels is to look for reasons why etc. rather than to blame individual(s). •people make use of some formal problem-finding and solving cycle
'Getting the CI habit' - the ability to generate sustained involvement in CI	•people use appropriate tools and techniques to support CI •people use measurement to shape the improvement process •people (as individuals and/or groups) initiate and carry through CI activities - they participate in the process •closing the loop - ideas are responded to in a clearly defined and timely fashion - either implemented or otherwise dealt with
'Focusing CI' - the ability to link CI activities to the strategic goals of the company	•individuals and groups use the organisation's strategic goals and objectives to focus and prioritise improvements everyone understands (i.e. is able to explain) what the company's or department's strategy, goals and objectives are. •individuals and groups (e.g. departments, CI teams) assess their proposed changes (before embarking on initial investigation and before implementing a solution) against departmental or company objectives to ensure they are consistent with them. •individuals and groups monitor/measure the results of their improvement activity and the impact it has on strategic or departmental objectives. •CI activities are an integral part of the individual or groups work, not a parallel activity
'Leading the way' - the ability to lead, direct and support the creation and sustaining of CI behaviours	•managers support the CI process through allocation of time, money, space and other resources •managers recognise in formal (but not necessarily financial) ways the contribution of employees to CI •managers lead by example, becoming actively involved in design and implementation of CI •managers support experiment by not punishing mistakes but by encouraging learning from them
'Aligning CI' - the ability to create consistency between CI values and behaviour and the organisational context (structures, procedures, etc.)	•ongoing assessment ensures that the organisation's structure and infrastructure and the CI system consistently support and reinforce each other •the individual/group responsible for designing the CI system design it to fit within the current structure and infrastructure •individuals with responsibility for particular company processes/systems hold ongoing reviews to assess whether these processes/systems and the CI system remain compatible •people with responsibility for the CI system ensure that when a major organisational change is planned its potential impact on the CI system is assessed and adjustments are made as necessary.
'Shared problem-solving' - the ability to move CI activity across organisational boundaries	•people co-operate across internal divisions (e.g. cross-functional groups) in CI as well as working in their own areas •people understand and share an holistic view (process understanding and ownership) •people are oriented towards internal and external customers in their CI activity •specific CI projects with outside agencies - customers, suppliers, etc. - are taking place •relevant CI activities involve representatives from different organisational levels

fashion, largely based on copying ideas which seem to work elsewhere, and on a generalised 'sheep dip' approach to training in basic CI tools. Whilst there is initial enthusiasm and support for the changes amongst the workforce, there is a risk that this 'honeymoon' period will be followed by one of disillusionment and a view that nothing has really changed — largely because nothing (in terms of structure, procedures, etc.) has. The challenge for organisations at this level is to move from

what is essentially playing with the concept of CI towards a more systematic design and implementation of a programme aimed at changing behaviour patterns.

Case (c) is an example of an organisation which has moved to a more systematic approach. It involves a medium sized (750 employees) organisation in the telecommunications equipment market, and experienced a period of radical change during the early 1990s. It faces a continuing need for improvements in quality, cost and

Table 2 (*continued*)

Ability	Constituent behaviours
'Continuous improvement of continuous improvement' - the ability to strategically manage the development of CI	•the CI system is continually monitored and developed; a designated individual or group monitors the CI system and measures the incidence (i.e. frequency and location) of CI activity and the results of CI activity. •there is a cyclical planning process whereby (a) the CI system is regularly reviewed and, if necessary, amended (single-loop learning) •there is periodic review of the CI system in relation to the organisation as a whole which may lead to a major regeneration (double-loop learning). •senior management make available sufficient resources (time, money, personnel) to support the ongoing development of the CI system.
'The learning organisation' - generating the ability to enable learning to take place and be captured at all levels	•people learn from their experiences, both positive and negative •individuals seek out opportunities for learning / personal development (e.g. actively experiment, set their own learning objectives). •individuals and groups at all levels share (make available) their learning from *all* work experiences •the organisation articulates and consolidates (captures and shares) the learning of individuals and groups •managers accept and, where necessary, act on all the learning that takes place •people and teams ensure that their learning is captured by making use of the mechanisms provided for doing so •designated individual(s) use organisational mechanisms to deploy the learning that is captured across the organisation

Table 3
Stages in the Evolution of CI

CI Level	Characteristic behaviour patterns
Level 1 - Pre-CI Interest in the concept has been triggered - by a crisis, by attendance at a seminar, by a visit to another organisation, etc. - but implementation is on an ad hoc basis	Problems are solved randomly; No formal efforts or structure for improving the organisation; Occasional bursts of improvement punctuated by inactivity and non-participation; Solutions tend to realise short-term benefits; No strategic impact on human resources, finance or other measurable targets; Staff and management are unaware of CI as a process
Level 2 - Structured CI There is formal commitment to building a system which will develop CI across the organisation	CI or an equivalent organisation improvement initiative has been introduced; Staff use structured problem solving processes; A high proportion of staff participate in CI activities; Staff has been trained in basic CI tools; Structured idea-management system is in place; Recognition system has been introduced; CI activities have not been integrated into day-to- day operations
Level 3 - Goal Oriented CI There is a commitment to linking CI behaviour, established at 'local' level to the wider strategic concerns of the organisation	All the above plus: Formal deployment of Strategic Goals; Monitoring and measuring of CI against these goals; CI activities are part of main business activities; Focus includes cross-boundary and even cross-enterprise problem-solving
Level 4 - Proactive CI There is an attempt to devolve autonomy and to empower individuals and groups to manage and direct their own processes	All the above plus: CI responsibilities devolved to problem solving unit; High levels of experimentation
Level 5 - Full CI Capability Approximates to a model 'learning organisation'	All the above plus: Extensive and widely distributed learning behaviour Systematic finding and solving problems and capture and sharing of learning; Widespread, autonomous but controlled experimentation

delivery performance in what is a highly volatile and competitive market place; one of its responses has been to try and instill a culture of CI. Although a number of efforts in this direction had already been made, the experience was similar to that in the two cases described above; limited and short-lived interest and success. By contrast their new programme involved extensive planning through a steering group made up of representatives from different levels in the company. Two full-time CI facilitators were appointed and over a six-month period a systematic and structured approach to implementing CI was developed. Components included:

- A basic training module designed to introduce problem-solving skills and then to practice these skills, first on 'classroom' projects and then on small-scale workplace problems,
- Identification and training of shop-floor problem solving teams,
- Facilitator training for CI team co-ordinators,
- Development of an 'idea management system' which identified the ways in which employee suggestions could be recognised, evaluated and implemented with minimum delay,
- Development of a reward system which offered simple ways of recognising and thanking employees for suggestions and reinforcing the behaviour, whilst also allowing for an equitable share of any major benefits which followed implementation of a particular idea.

The project was targeted first at a pilot area and then reviewed; those involved in the pilot then acted as 'missionaries' to take the approach to the other groups so that the diffusion of CI took place in a gradual and 'home grown' fashion. During the pilot and subsequent roll-out the CI facilitators were actively involved in continuous adaptation and improvement of the basic CI process and supporting mechanisms and the whole programme was reviewed on a monthly basis by the steering committee.

This example shows a much more structured approach which contains mechanisms designed to establish and reinforce some key behavioural routines. There is considerable scope for fine-tuning within this framework but it has already established a discernible pattern of local level improvements.

Although this case represents a more structured approach and can demonstrate sustained benefits these are mainly concentrated at a local level and there is a longer term risk of running out of steam. The main weakness in this approach is a lack of targeting of improvement activity, and associated with this, a lack of monitoring and measuring of key variables to guide and shape this CI behaviour.

Case (d) is an illustration of a company in which such targeting behaviour is in place. It is a medium-sized (300 employees) manufacturer of plastic films and packaging materials. CI has been in place for seven years and during the past three years a systematic programme of policy deployment has been used to link CI behaviour to the strategic goals of the business. The company articulates a top level strategic plan — their three year review — and then breaks down the component elements in a systematic fashion to generate a set of improvement targets for every area and level of the business. The process through which this is achieved is essentially a 'consultative cascade' in which people get a chance to discuss and explore the strategy as it relates to their area, and to set goals which they are clear about. (The mech-

anisms form part of what is sometimes termed the 'Hoshin Kanri' approach) (Shiba et al., 1993).

Day to day operation of CI is similar to case (c) in terms of group and individual activities, use of problem solving approaches, idea management, reward and recognition, etc. The main differences are in the selection and targetting of improvement objectives and in the regular monitoring and measurement pattern (in this case via a daily pre-production meeting which review progress and sets up new targets). The benefits are clear and now feed directly into the strategic performance of the company — because they were designed to do so. Over the five years in which this approach has been operating they have cut what they term 'cost of maintenance' (analogous to cost of quality, and including the real costs of poor maintenance etc as well as the prevention and cure costs) by 25%, although some of this is clearly due to process and equipment change as well as CI. At the same time productivity, measured as tonnes per employee rose from 680 in 1993 to around 1000 in 1996.

Case (e) takes this a stage further. Having established a pattern of CI which includes policy deployment over the preceding six years, this company (a small firm making specialist meters and gauges and employing 30 people) now operates a highly devolved system. Individuals and groups are aware of the overall objectives and key strategic measures and are encouraged to initiate CI activity wherever and whenever they can. They are well trained and experienced in the basic tools and techniques of CI and take time out during their working day to experiment and develop new ideas. None of this is controlled or directed by management, and there is no formal process for evaluation or costing the time and resources used for many of the smaller projects. The site director is aware of what is going on (a major advantage of a small company) and for larger projects will be involved in allocating resources, but his attitude is primarily "…they know the strategy, what we are trying to achieve, they've all been trained and know how to solve problems — and I *trust* them". In other words CI has developed to the point where it is very much part of 'how we do things around here' and has become routinised to the point where staff feel empowered to take initiative. The benefits of this approach are significant; in addition to strong performance against key strategic indicators the company has won several awards for being one of the best factories in the UK. Importantly the senior managers see this not as a by-product but as directly attributable to the embedding of CI routines within the company.

A final example is another medium-sized business in the process industries, employing around 600 people. Here CI has been established for over a decade and has developed from an occasional 'add-on' to become embedded in the normal working culture — to the point where it is not formally labelled in the organisation. Indi-

viduals and groups regularly seek out and solve problems, and there is a wide range of project activity within and across departmental boundaries, and including a major supplier development programme with external organisations. Policy deployment is embedded in the operating procedures so that CI activities are targetted and progress is monitored and measured. An important aspect of the CI behaviour is a strong emphasis on documenting how problems are solved and who to ask for help with similar problems — in other words, an approach to knowledge capture, sharing and management.

Significantly problem solving is not confined to bringing processes back under control through minor adjustments and improvements; here there is also considerable experimental activity in support of developing completely new products and processes. It could be argued that, having embedded CI behavioural routines in the culture to deal with improvements — 'doing what we already do better' — the company is now developing high involvement routines for *innovation* — doing completely new things.

These six cases provide a brief illustration of the range of experience with CI. Far from being a binary, on-off activity CI is an evolving pattern of behaviour development and integration. In the context of the discussion in this paper we suggest they indicate the ways in which development and assimilation of the key behaviours identified in the model take place. We would also argue that it is possible to use the model to position such cases against stages in the model, and to use this positioning as an input to assist further development of CI. (Detailed case studies of these and other organisations can be found in Bessant, 1997; Gallagher and Austin, 1997).

7. Performance and practice correlation

Viewed in this way we can see the evolution of CI capability as the development of a resource within the firm which conforms to the new strategy thinking — it is firm specific, hard to copy and must be learned.

But we can also correlate the possession of this capability — especially in its more developed forms — with improved performance. For example, Table 4 shows levels of impact associated with each level.

8. Enabling development of routines

As an analytical construct we suggest that the evolutionary model has some value in explaining CI behaviour and in differentiating the range of experience of firms. But it does not yet explain how routines can be developed within the firm; this was the main focus of the CIRCA's work.

Whilst detailed discussion of this lies outside the scope of this paper, it will be useful to review briefly the use of this approach in organisational development of CI capability.

The research suggested that development and reinforcement of behaviours and routines could be enabled by a variety of things — training, structures, tools, procedures, etc. Firms reported a wide and rich variety of these and there is clear evidence of contingency — different enablers or variations of enablers are used to achieve the same ends of behaviour development.

Arguably the model of behaviours is generic but the mechanisms whereby firms achieve them is contingent — different enablers need to be used under different circumstances.

Underpinning this is our methodology for development of CI which owes much to other organisational development (OD) approaches (French and Bell, 1995). Basically it involves a cyclic process made up of the following stages:

- Diagnose — through the audit tools developed around the behavioural model,
- Visualise where the next feasible steps in development are likely to be (Reinforcing certain behaviours and developing new ones to add),
- Implement changes using a selection of appropriate enablers,
- Review and repeat.

An example of this process in operation can be found in Bessant and Francis (2000).

9. Conclusions

In this paper we have argued that continuous improvement (CI) is of considerable strategic importance, but that its management is often poorly understood. The problem occurs in part because of confusion surrounding the term itself since CI refers not only to the outcomes but also to the process through which these can be achieved.

We have argued that managing this process effectively depends upon seeing CI not as a binary state or a short-term activity but as the evolution and aggregation of a set of key behavioural routines within the firm. (Arguably it was simplistic interpretation of the nature of CI that contributed to the experience of disappointment and failure in many CI programmes started during the 1980s as part of the 'total quality' movement).

Building behavioural capability of this kind constitutes an important contribution to the resource base of the firm and one which it can deploy in pursuit of a variety of strategic goals — lower costs, improved qual-

Table 4
An explanation of the different levels

Level	Performance	Practice
0=No CI activity	No impact from CI	Dominant mode of problem-solving is by specialists
1=Trying out the ideas	Minimal and local effects only. Some improvements in morale and motivation	CI happens as a result of learning curve effects associated with a particular new product or process - and then fades out again. Or it results from a short-term input - a training intervention, for example, - and leads to a small impact around those immediately concerned with it. These effects are often short-lived and very localised. Problem-solving random. No formal efforts or structure. Occasional bursts punctuated by inactivity and non-participation
2=Structured and systematic CI	Local level effects. Measurable CI activity - e.g. number of participants, ideas produced, etc. Measurable performance effects confined to projects. Little or no 'bottom line' impact	Formal attempts to create and sustain CI. Use of a formal problem-solving process. Use of participation. Training in basic CI tools. Structured idea management system. Recognition system. Often parallel system to operations. Can extend to cross-functional work but on an ad hoc basis
3=Strategic CI	Policy deployment links local and project level activity to broader strategic goals. Monitoring and measurement drives improvement on these issues which can be measured in terms of impact on 'bottom line' - for example, cost reductions, quality improvements, time savings, etc.	All of the above, plus formal deployment of strategic goals. Monitoring and measurement of CI against these goals. In -line system.
4=Autonomous innovation	Strategic benefits, including those from discontinuous, major innovations as well as incremental problem solving.	All of the above, plus responsibility for mechanisms, timing, etc., devolved to problem-solving unit. High levels of experimentation.
5=The learning organisation	Strategic innovation. Ability to deploy competence base to competitive advantage	CI as the dominant way of life. Automatic capture and sharing of learning. Everyone actively involved in innovation process. Incremental and radical innovation.

ity, faster response, etc. However the process of accumulating such a resource is a long and difficult one involving articulation and learning of behaviours and practising and reinforcing them until they become routines — 'the way we do things around here'.

Experience in a variety of case examples suggests that the development is essentially an evolutionary process, and that it is possible to identify several discrete stages on the journey towards CI. Learning has to take place both within a particular stage (establishing and embedding routines) and between stages (moving to add new routines and integrate them with earlier ones). This process is analogous to the concept of 'double loop' or 'generative learning' identified in the literature (Argyris and Schon, 1970; Senge, 1990).

It is also clear that although there is contingent variation amongst firms, there is also commonality in the nature of problems encountered in building CI capability. At the same time there is widespread experimentation with different approaches to dealing with such problems and with finding ways around particular blocks

to progress. Finding mechanisms to share experience of this kind and to enable transfer of useful 'enablers' is likely to be of considerable benefit and is being used in an increasing number of policy initiatives — for example, the 'Industry Forum' programme in UK automotive components.

One last point is worth mentioning. In this paper we have addressed the question of CI largely as a set of routines for doing what we already do better. But there is emerging evidence that this capability, once established, can also contribute to doing new things — to 'innovation' routines. Many of the characteristic behaviours at the higher levels of our model are essentially similar to those routines identified in work on innovation — for example, experimentation in R&D.

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