Kaizen (or Japanization) the way forward outside of Japan. An analysis of the

implications for a Japanese company based in Ireland as a result of the
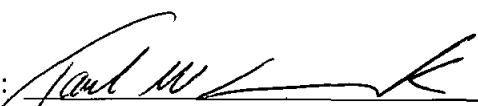
introduction of Kaizen.

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A dissertation submitted in partial fulfilment for a BA honours in Business

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Declaration

I hereby certify that this dissertation which I submit in partial fulfilment of the degree in Ba (Hon) in Business, is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

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ABSTRACT

This study is based on a Japanese owned manufacturing company located in Ireland. The company was originally led by Irish managers, there was a change of management and it is now led by Japanese management. There has been more focus on Japanese principles since, and the company has introduced the Japanese system of Kaizen.

Kaizen is Japanese for Continuous improvement, which means the focus is on small incremental improvements which when added together improves all aspects of the organisation.

This study examines the cultural shift in thinking and examines if such a system can be transposed from Japan to a western company and what the implications are on the organisation.

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ACKNOWLEDGMENTS

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CHAPTER 1

INTRODUCTION

1.1.0 Motivation for this study

There is a decline in the manufacturing sector in Ireland at present and as such there is a need for companies to become more productive in what they do. No longer are companies competing locally they now have to consider the global market.

With this competition comes success or failure. Japan has been seen as the leader when it comes to productivity and efficiency, which is driven by what is called Japanization. This Japanization is a conglomeration of many factors, which will be discussed in detail in Chapter two.

With access to an Irish/Japanese manufacturing organisation in Ireland, it was an ideal opportunity to examine whether Japanization can be transferred.

1.1.1 Broad outline of the study

This paper is broken down into four main sections. The first part contains Literature, which is reviewed from academic studies and renowned authors in each field. This area will clarify the subject of Kaizen to those unfamiliar with the subject. Add to this there are three case studies, which were analysed and dissected to highlight the salient points around kaizen and the processes used to initiate it.

In the second part the research methodology is described, which explains the processes used to research the subject.

The final part, examines the findings and analysis of the data collected and this paper will discuss the implications for an Irish company

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LITERATURE REVIEW

This literature review examines Kaizen and it is described using a balanced view from many trustworthy sources. The process of Kaizen is explained and the elements involved in kaizen itself. Kaizen as suggested below is not a new phenomenon in the industrial world; in fact Henry ford used a similar approach along with Taylorism.

The Japanization process and concepts are examined and the interaction of this with western culture is analysed using different aspects of Japanization. The author then goes on to the organisational impacts of Kaizen and Japanization.

The latter part presents three case studies, which are examined to give a working example of Kaizen in action.

2.1.0 Kaizen

Kaizen- what is Kaizen, directly translated it means continuous improvement, it has been seen as a key success factor in Japanese companies; it has also been described as "pervasive and continual activities" *(Brunet, et al. 2003)*. Masaaki Imai brought the concept of Kaizen to the west in 1986 it was introduced as a broad philosophy and also on of the main ideas of total quality control (TQC) *(Elger et al. 1994 p.68)*. Kaizen can also be described as Lean manufacturing, which means using the best practices and the least amount of resources to produce at a high level *(Elger et al. 1994)*.

The use of the word is well known in the manufacturing sector. However in Ireland there has not been much take up of the process. Yet this is changing as can be seen from this dissertation. Many Japanese leaders see Kaizen as the difference between their business and their competition.

As *Ian* suggests in his paper on Kaizen, " kaizen breakthrough" events can make large savings for companies, such as 40% in productivity and 60% in work in progress inventory, with working floor space being reduced also. He also notes that in the company monitored that the employees looks forward to running such events *(Ian 2000)*. However it was also noted in the paper on Kaizen that "Continuous improvement means continuous change, but many companies are not ready for the pain that goes with it" *(Ian 2000)*.

Kaizen is also an attitude, it is not just about improvements, the process is sometimes more important than the results. It is a method of changing the way a person or company thinks. This can been seen in figure 1 below, in relation to the attitude or mindset differences between the west and Kaizen approaches.

Kaizen attitudes

If it ain't broke don't fix it.

The western attitude ' I reached my targets, that is enough'

The kaizen attitude 'Don't aim for perfection, it is not good enough'

It's none of my business

The western attitude 'That is not my problem, I only work in this department'

The kaizen attitude 'There seems to be a problem, I wonder what we can do about it?'

The uniforms are dirty

The western attitude 'Please keep your uniform clean'

The kaizen attitude 'Why did the uniforms get dirty and lets remove the reason that caused the dirt'

Figure 1 Kaizen Attitudes

Adapted from (Cane 1996 p.6)

The kaizen attitude is also based on long-term success rather than short-term. The Japanese tax system does not favour the short-term investors and hence companies are not focused on short-term success or profit levels. This aids Japan in the kaizen process, they then focus on researching the production process and making continuous improvements *(Cane 1996 p7)*. However, Elger suggests that kaizen is a form of hegemonic control, in that the main idea of Kaizen is to extract each and every second from the work procedure. The employee is encouraged to make suggestions and in some case pressure applied, when an improvement is made rather than the employee benefiting from the time saving, they are given more work to fill the void. This other work would be extracted from other sections, thus lowering the total amount of people it takes to do a task *(Elger et al. 1994 p137~138)*.

Following on from that, Burawoy's theory of 'making out'- in which workers use the spare time to play games while still making quotes, is quashed by the Japanese system of Kaizen, for two reasons.

One, constant disruption is instilled with the process of Kaizen by continually changing the process and not allowing time for workers to start 'making out'.

Two, once the process is kaizened and all time is extracted from the process the management knowledge of the process is such that they know exactly how much labour is required for a task *(Elger et al. 1994 p137~138)*.

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Within Kaizen there are some elements, which aid the improvement process, these will be discussed later, such as; Just in time, Total Quality Control, Quality Circles and the Five S's.

2.1.1 Classical management approaches

The study of kaizen or Japanese manufacturing principles in not a new phenomenon, many of the ideas Japan now export are in fact taken directly from Taylorism.

Frederick Taylor started the birth of the scientific management and developed these theories in two books, *Shop Management (1903)* and *Principles of Scientific Management (1911)*. The principle of this concept was that there was one best way to do tasks *(Tiernan et al. 2001 pp 11~14)*. Japan embraced these concepts and held on to them long after the west grew out of these methods of work.

Taylor's experience developed four main principles of management:

- **Development of a true science of work.** This is where a task is broken down into its basic movements and scientifically analysed to develop the best way of doing the task.

- **Scientific selection and development of workers.** Taylor realised that it is very important to get the correct fit between the task and the person, matching people to specific tasks became very important.

- **The cooperation of workers and management in the studying of work.** The cooperation of workers and managers is important to ensure the best outcome for the task, these included breaks for workers and job cards.

- **The division of work between management and workers.** Taylor believed that managers and workers should do the tasks which they were best equipped to do, managers organise and workers complete the tasks.

(Tiernan et al. 2001 p.12).

There is a very similar vein of thought running through the Japanese Kaizen approaches. Time studies are also seen as a very important part of the Kaizen process *(Elger et al. 1994 p.137).*

The traditional Kaizen approach:

- Analyse every part of the process down to the smallest detail.

- See how every part of the process can be improved.

- Examine employee's actions and materials to see if they can be improved.

- Examine ways of saving time and eliminating waste.

(Cane 1996 p8).

As seen for the above TQC section Deming, Juran and Feigenbaum all had a part to play in the 'Japanization' process, which is assumed to be formulated within Japan *(Oliver et al. 1988), (Schonberger 1982).*

2.1.2 Just in Time – JIT

JIT is a very simple concept, it is based on the premise that a company must order materials just in time for the sub assemble process. Following on from this the sub-assemble process must only assemble just when the parts are needed for the full assembly requirement and the assembled part to be shiped just when it is required by the customer. It follows that this system works on the basis of "Just in Time" and not like the western approach of "Just in Case" management *(Schonberger 1982 pp.16~20).* This type of production leads to no waste and no large inventory stock thus reducing costs.

The system does fall down when one of the supply chain fails to deliver, however this is addressed by having multiple suppliers for each function and to root out the causes that could cause work stoppages *(Schonberger 1982 pp.30~35).* This system was created in the Toyota factory in Japan, according to *Voss.* It was borne out of the oil crisis in the 1970's and it was such a success that other Japanese companies began to emulate it *(Oliver et al. 1988 p. 12).*

The system used simple Kanbans (Cards or signs), when the stock level reaches a certain point, the card that is at that point, alerts the person to take the card/ Kanban and reorder the product. This system ensure that the stock levels will never run out of product and the reordering of the part will be at the correct time *(Oliver et al. 1988 p. 11~15)*. This system can reduce inventory in the region of 60% as, which leads to higher profit levels leading to leaner companies *(Ian 2000)*.

2.1.3 Total quality control - TQC

The idea of Total quality control actually came from America; Mr A.V. Feigenbaum coined the term *(Schonberger 1982 p.47)*. The principle of the idea was that the maker of the product should be the one responsible for the quality of the product. This diverges from the traditional Quality Control QC, where there is a final QC check at the end of the process, thus the onus was on them to detect quality errors.

However, Oliver noted that it was *Juran* which brought TQC in the form of 'company wide quality control', as he was invited to Japan in 1954. Deming was also peddling the same concepts during this period *(Oliver et al. 1988 p8)*. Nevertheless the west ignored these ideas and it is only since the 1980's did the west developed an interest in these processes *(Oliver et al. 1988 p8) (Schonberger 1982)*.

TQC has more to it than each person taking responsibility for their own work, it is also a philosophy, the habit of improvement, creating easy to find errors, ability to stop the production line if required, creating foolproof devices and many more *(Schonberger 1982 pp.47~82)*. All these processes are behind the idea of TQC, which is an integral part of the Japanese organisation.

2.1.4 Quality Circles (QC's)

Quality circles are where a group of employees meet to discuss any issues relating to improving quality within their work area.

QC's do not seem to be transferred into western companies and it is suggested by the president of a large Japanese company that QC's are more ritualistic than useful *(Schonberger 1982 pp.182~185)*. The system seems that it creates a social bond rather than helps the quality process. There is evidence that also suggests that the QC's which were founded in the early 1960's helped to put people in the mindset of quality consciousness, which helped the overall Kaizen process indirectly *(Schonberger 1982 pp.182~185)*.

However, *Elger* noted that the team idea does place peer pressure on each member if they do not conform to the level required of them, which saves discipline coming down from the management side *(Elger et al. 1994 p135~136)*. This would support the subtle hegemonic control mechanisms that the Japanese management structure uses *(Elger et al. 1994 p137~138)*.

2.1.5 The 5-S Principles

The 5-s principles come for the Japanese words Seiri, Seiton, Seiso, Seiketsu and Shitsuke. These words are explained in figure 2 below.

The idea behind this is that a person or company should always aim to achieve these principles; if this is attained then the process used in conjunction with it will improve of its own accord. There are five stages of the 5-S implementation process, these are: the top management must be behind this system one hundred percent, the idea 5-S must be promoted within the organisation, records must be kept as part of the process, training must be given on the process and evaluation of the results is necessary to complete the process.

Pomlett noted that there was another system very similar to the 5S's called the three S's *S'eiei, S'eiton and S'eiso.*

S'eiei: Meaning to get rid of things you do not need.

S'eiton: To put things you need to one side in readiness for use at any time and

S'eiso: To keep things neat and tidy

(Pomlett 1994).

The 5-S practice: English equivalents, meanings and examples

The 5-S practice: English equivalents, meanings and examples

Japanese	English	Meaning	Typical example
Seiri	Structurize	Organization	Throw away rubbish
Seiton	Systemize	Neatness	30-second retrieval of a document
Seiso	Sanitize	Cleaning	Individual cleaning responsibility
Seiketsu	Standardize	Standardization	Transparency of storage
Shitsuke	Self-discipline	Discipline	Do 5-S daily

Figure 2 The five S's

'Taken from *Ho et al.* TQM Magazine'

Kaizen as seen above is continuous improvement, however there is more to it than just making improvements. To have an efficient kaizen program it requires some integral parts. These are JIT, Total Quality Control TQC, Quality circles as discussed above and there are many other systems used also, Statistical process control SPC, Kanbans and PDCA: Plan DO Check Act. Unfortunately the west may embrace Kaizen as a principle, but they rarely follow through on the other more integral parts as above *(Cane 1996 p8)*.

2.2.0 The concept of Japanization

The term Japanization came about in 1986 by Peter Turnbull. He was reporting on organisational changes in a company Lucus Electrical, they were using production methods similar to the Japanese and the term was coined there *(Oliver et al. 1988)*.

The concept itself can be broken into three veins of Japanization:

1. **Mediated Japanization I:** This is where western firms adopt the Japanese methods and there is a simple transference of the Japanese model.

2. **Mediated Japanization II:** Where there is believed to be a hidden agenda behind the implementation of Japanization. This hidden agenda is one where there is a need for more productivity and competitiveness where this system is used as a legitimate tool to achieve organisational change, thus forcing employees to accept these Japanese methods.

3. **Direct Japanization** which is when foreign direct investment FDI comes from Japan into western countries and then they apply the Japanese methods to their production

(Proctor et al. 1988)(Oliver et al. 1988 pp.2~3).

Many manufacturing companies are interested to use the Japanization practices such as Just in Time JIT manufacturing and can link these more productive systems to their benefit under the guise of legitimacy, just because Japan use it and are very successful with the results from it *(Oliver et al. 1988 pp.2~3).*

2.2.1 The Japanese Model vs. Western Model

Japanese organisations are quite original as described by *(Ouchi 1981)* they are based on lifetime employment. The process of recruitment is a long drawn out practice with the aim of recruiting the most appropriate candidates for that specific company. Once candidates are chosen they are then put on a non-specialised career path. Promotion does not happen fast and people are evaluated over long periods of time *(Schonberger 1982)*.

The Japanese use implicit control mechanisms, which make it hard for any non-Japanese to understand, non-Japanese are termed 'Gaijin' and are treated differently to Japanese. Decision-making and responsibility are made through collectivism, described in section 2.3.2 Collectivism (groupism) below.

The western organisation is somewhat the opposite of the Japanese model. Employment is short term and employees cannot be assured of a long-term job. The evaluation and promotion of individuals is rapid and is based on ability, their career paths are well defined and specialised *(Ouchi 1981)*.

The control mechanisms are explicit and many procedures are used to describe what to do and how to do it. The individual is responsible for decision-making and will be held responsible for those decisions. This western approach means that each person is concerned about themselves rather than the group as a whole *(Ouchi 1981, Oliver et al.1988)*.

The differences are highlighted in the Figure 3 in section 2.2.2 below.

2.2.2 Theory Z

William Ouchi developed a theory called Theory Z, he analysed both Japanese organisations and western organisations and found some of the Japanese principles at play in successful American companies. This led him on to Theory Z, which takes the best of the Japanese style and western style organisations and suggests that this Theory can be adapted by all cultures *(Ouchi 1981)*. Ouchi states that the problems the western companies are having cannot be solved with money or more investment in research and development, the focus must be on how to manage people and recommends theory Z as the way to undertake that *(Mullins 2005 p240)*. The different styles are highlighted in figure 3 below.

Elger suggests this system can read in different ways be the employees themselves and see it as a subtle coercion/Hegemony to the will of the company using teams as the medium.

Proctor and Oliver in section 2.2.0 above also pointed to the fact that the second part -Mediated Japanization II, in which there is believed to be a hidden agenda behind the implementation of the Japanese model, which needs to be considered. Where there is a need for more productivity and competitiveness and is used as a legitimate tool to achieve organisational change, thus forcing employees to accept these Japanese methods *(Proctor et al. 1988)(Oliver et al. 1988 pp.2~3)*.

These differences can be seen as an obstacle to the introduction of such methods.

Japanese Model	Western Model
• Lifetime employment • Slow evaluation and Promotion • Non-Specialised career paths • Implicit control mechanisms • Collective decision making • Collective responsibility • Holistic concern	• Short term employment • Rapid evaluation and promotion • Specialised career paths • Explicit control mechanisms • Individual decision making • Individual responsibility

Theory Z

- Long-term employment often lifetime
- Relatively slow process of evaluation and promotion
- Develop company specific skills and a moderately specialised career path
- Implicit control mechanism supported by explicit formal measures
- Decision making by consensus
- Collective decision making but ultimate individual responsibility
- Concern for welfare of all workers

Figure 3 Ouchi's Models

Adapted from Ouchi 1981 p.58, Mullins 2005 pp.240~241

2.3.0 Cultural differences and communication

Culture is defined as a set of beliefs, values and similar understanding between people within organisations *(Daft p44)*.

Organisational culture is a difficult thing to define; the concept of culture has come from anthropology. Sometimes there is confusion of organisational culture and organisational climate. Atkinson explains it as what is 'acceptable and not acceptable' and is often described as ' the way we do things around here *(Mullins 2005 p.891)*.

Schein states that organisational culture is based on three different levels of culture, Arefacts, values and assumptions.

> **Arefacts:** What a person feels, observes or notes, such as the physical environment.
>
> **Values:** These would be goals, ideals, norms, these values can be justified by the group once seen that they work.
>
> **Assumptions:** May start out as values but as the values are compounded by the fact the value has worked, it will no longer be questioned and from then assumed to be the norm.
>
> *(Schein 1988)*

Japanese culture is very different to western culture especially in regard to their work ethic. Once Japanese companies go abroad to set-up organisations, they have to deal with different cultures, the merging of these cultures may bring problems. Indeed this has been seen in many US-based manufacturing companies as they have trouble with employee performance approaches *(Swierczek et al.,2003)*.

Different cultures within an organisation can be a problem, it can lead to underlying tension and sometimes issues would not be reported until it was too late *(Brett et al. 2006 HBR)*.

2.3.1 Communication

The Japanese use an indirect method of communication, which is sometimes confusing to western managers. It is difficult to understand when yes does not necessarily mean yes, it may just mean they are listening to you (*Brett et al. 2006 HBR)*. In western culture communication is direct and explicit, it is either yes or no, there tends to be no ambiguity. This is found to be one of the most difficult things for westerners to understand about the Japanese culture. The Japanese have many different words for not saying 'No', in the table below there are sixteen methods for avoiding saying no *(Adachi. 1997)*. These differences are difficult for non-speaking Japanese to understand; yet they are very clear to the Japanese person *(Adachi. 1997)*.

1	Vague "no"
2.	Vague and ambiguous "yes" or "no"
3.	Silence
4.	Counter question
5.	Tangential responses
6.	Exiting (leaving)
7.	Lying (equivocation or making an excuse—sickness, previous obligation, etc.)
8.	Criticizing the question itself
9.	Refusing the question
10.	Conditional "no"
11.	"Yes, but . . ."
12.	Delaying answer (e.g., "We will write you a letter.")
13.	Internally "yes," externally "no" -
14.	Internally "no," externally "yes"
15.	Apology

Figure 4 'No' avoidance

Taken from Adachi 1997

2.3.2 Collectivism (groupism)

In Japan there is a concept called "Groupism" this is where the requirements of the group outweighs the needs of the individual. Hayashi suggests that this arose from agricultural practices and also from the Samurai era *(Ouchi 1981)*. This is still prevalent in today's Japanese societies as Ouchi notes, in large firms in Japan this groupism results in the linking of the business as part of the family. This then brings the idea of lifetime employment, with lifetime employment comes the loyalty and to go beyond the reasonable limits of normal work requirement as can be seen in section 2.4.0 below *(Direction 2004)*. This leads the Japanese to hold quality circle meetings after work and not get paid for them.

This collectivism is something which bonds the Japanese together; it makes each person think of the company rather than themselves. Hence the company can become more of a family to them than there own family *(Meek 2004 p 315)*.

2.4.0 Work practices

Using Kaizen in the workplace brings on some other challenges. The introduction of such a system is generally brought about due to a lack of something in the organisation, efficiency for example. This means that more than likely the workforce are already struggling to do their daily tasks. To introduce a new system brings more challenges on the workload.

However the Japanese work ethic is completely different to western ethic, perhaps due in part to the 'life-long employment' factor. It was found that Japanese use of Kaizen extended beyond the normal working day *(Direction 2004)*. This type of work ethic enables Japanese companies to be more competitive in the implementation of such a Kaizen programme.

In the same report it was found that Nippon Steel Corporation workers spent an average of 24 hours per month on Kaizen and team leaders 45 hours per month. This can explain the type of commitment there is within Japanese organisational culture *(Direction 2004)*.

2.4.1 Productivity

The Japanese do not have a great history of measuring productivity when compared to the United States or Europeans. One of the reasons would be that the Japanese do not operate incentive schemes for better productivity, unlike the Americans *(Stainer1995)*. As seen in section 2.3.2 above the Japanese are not there for themselves but are working for the collective good.

In regards to Japanese philosophies on productivity the quote below highlights some of their ideas on it.

"The Japanese Productivity Center has three guiding principles:

- *Increase of employment: improvement in productivity will increase rather than reduce employment in the long run.*
- *Labour-management co-operation: in order to increase productivity, labour and management must work together.*
- *Fair distribution of productivity gains: the fruits of improved productivity should be distributed fairly among management, labour and consumers."*

There is no reference to efficiency or rationalisation in the above principles. The Japanese have been able to understand the link between productivity and quality as in the Deming chain reaction Fig 1 *(Stainer 1995)*.
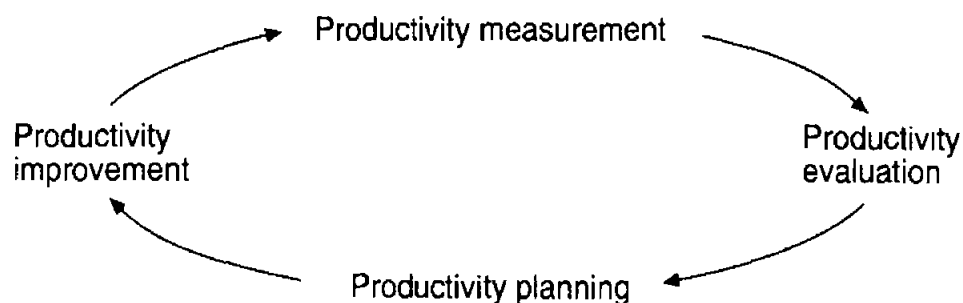
Fig.1 Deming's Chain reaction

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2.4.2 Innovation

The innovation process is similar to that of kaizen, as they both develop ideas into actionable improvements. It is seen also that the interest in innovation has moved away from the research and development area to the more tangible area of outputs *(Mc Adam et al. 2004)*.

Klomp and Van Leeuwen suggest that this has led to the realisation that the innovation process or Kaizen to be a driving factor of long term economic growth *(Mc Adam et al. 2004)*. This is where the Japanese have excelled in the process of innovation, they have formulised the process into what they call Kaizen and it has become a tangible asset. The kaizen process requires product innovation to be in close collaboration with other functions within the organisation for the idea to work as suggested in Harvard Business Review *(Lorsch et al.1965)*.

2.4.3 Organisational change

Change is continually happening around us, it will continue to happen and it is the one thing that can be assured. Change can be directed or it can evolve slowly in an organisation, change such as introducing a Kaizen scheme into a factory that before did not have that type of culture can be hard to adapt to.

Change is something that companies have to embrace if they wish to be successful. *Lewin* developed a process, which aims to improve the process of behaviour modification.

> **Unfreezing:** recognising that change is necessary and removing obstacles, which would prevent change.
>
> **Movement:** this is where it is necessary to develop behaviours and attitudes to allow implementation to occur.
>
> **Refreezing:** this is where the change is established and it is reinforced through structures, norms and policies.
>
> *(Mullins 2005 p.910)*

The above process helps to reduce the resistance to change and enables the organisation to move the process of change along at a faster rate.

Kotter and Cohn listed eight steps to aid effective change:

- **Create a sense of urgency:** The management need to inform their team that this is important and necessary.

- **Build a guiding team:** Leadership and skill are required to create change.

- **Communication:** People need to be informed about the change and they need to understand it.

- **Empower action:** ensure that people are working toward the vision and remove obstacles from their path.

- **Allow short-term wins:** this develops a belief in the change.

- **Do not let the process waiver:** ensure there is wave after wave of change.

- **Make change stick:** develop the change and turn it into the new company culture.

(Mullins 2005 p.916)

2.4.4 Leadership

Part of the process of change is leadership, which has an integral role to play.

The definition of Leadership is not agreed by academics, the reason is that it is such a broad concept and does fall with stated parameters *(Tiernan et al 2001 p234~235)*. However Mullins describes it as 'getting others to follow' or 'getting people to do things willingly *(Mullins 2005 p281~283)*.

There is also a distinguishable difference between leaders and managers as *(Tiernan et al. p236~240)* describes. This is where Quality circles can be a very useful tool. The premise that all managers are not necessarily leaders as suggested by *Tiernan et al.* means that QC's have more of a propensity to develop a leader out of these teams. This would have the benefit of adding capability to the organisation, to achieve a more successful organisation.

When implementing a system such as Kaizen, it would be very important to have a leader who could bring the organisation to embrace such new and foreign ideas.

2.5.0 Case Studies

Three case studies have been chosen to develop the theoretical knowledge in the above sections and for comparison for this paper.

Case study 1 Dieselco taken from: *(Malloch 1997 Strategic and HRM aspects of kaizen: a case study)*. Appendix 2

Case study 2 Vehicle Radiator Manufacturer VRM taken from: *(Kerrin 1999 Continuous improvement capability: assessment within one case study organisation)*. The actual name of the company was omitted for privacy reasons. Appendix 3

Case Study 3 CAMI taken from *(Elger et al. 1994 p. 152~171)*. Not in appendix as taken from book as referenced.

2.5.1 Case study 1 Dieselco

Profile:

Dieselco is a diesel engine manufacturer, they have plants in 30 different countries two of which are in the UK, and this branch for the four years leading up to 1989 had losses of 50million pounds. These losses mirrored the group as a whole. It was this that spurred them to go down the route of Kaizen and lean manufacturing. In 1996 Dieselco employed 650 people.

Outlook for Kaizen:

Kaizen was viewed very highly as a process to change the company for the better, judging by their losses something needed to be done. They were in a competitive market and went up against such companies as Volvo, Ford and Caterpillar.

The company deliberately did not use the name Kaizen in the implementation of the process, the word Lean production was considered more appropriate. The company chose to use the terms common approaches to continuous improvement CACI and a seven-step program for problem solving.

The management team went to America to partake in a Kaizen program for one week and found that the people teaching it could not explain the process and the group did not get much from the training program. However a Japanese company-Osaka Engines - had a stake in Dieselco and with their help the process took off and the Kaizen team understood how it should be running.

Processes used to achieve improvements:

With the help of the Japanese company the teams developed methods for reducing wasteful human actions. This was the main focus on the kaizen process in Dieselco. The Japanese taught the team the processes required to find waste in the any section of the organisation.

The process used was video taping a process and analysing the video again and again to determine down to the second each wasteful action. This involved working out the takt time for each task (takt time = process time). If the customer required 30 engines each hour then the takt time for an engine needs to be 2 minutes. It meant that the team needed to get every process outputs to be 2 minutes; this involved again analysing each function and eliminating the waste.

Implementation:

The implementation of the kaizen program as seen did have to be handled delicately. During this period the unions were very concerned and distrustful of new ideas that seem to exploit the workforce, as can be seen from Parkers comments in the case study, stating that Kaizen was "Management by stress", "places workers on an ever-accelerating treadmill that they must improve to survive" and "harder for older workers to physically survive in the plant". However the company did train over 60 workers in Kaizen and had 16 people full time in the Kaizen team. The Kaizen teams were members of the factory and it was not like industrial engineer coming into a new environment and trying to learn about the systems used. It was easier for the workforce to accept this type of approach. The workers in the factory seem to take the Kaizen process onboard and realized that the process actually reduced their daily stress by taking the unnecessary movements out of the working day.

The Kaizen initiative ended up saving the company £2 million in three and a half years. It was seen as a resounding success and a process that needed to be undertaken and to be followed through for the future.

2.5.2 Case study 2 Vehicle Radiator Manufacturer VRM

Profile:

This case is about a company in the UK who was originally a British owned venture and was taken over by a Japanese company in 1988. Since the takeover there has been a move to Japanese the processes within implementation of such systems as SPC, JIT and Kanbans. The company has 840 people located in two plants the larger one holding 700 of those employees.

The company manufactures radiators and cooling systems for the car and truck industry and supplies to companies worldwide.

Outlook for Kaizen:

When the company was taken over by the Japanese the drive from then was to introduce the Japanese style of management. The British managing director and his Japanese colleague drove the Japanization forward in the company. They used the words Continuous Improvement CI rather than Kaizen as their main driving force behind change.

The company undertook a pilot program on CI in 1991 and it was successful, however the management only partook of it and it was felt that it needed to be a company wide process. The CI drive that is covered in this case study involved the whole company.

Processes used to achieve improvements:

Even though the term Kaizen was not used that much in this case study the processes mirrored the kaizen process. They used Quality Circles, Kanbans, JIT, and suggestion schemes.

The suggestion scheme system was a major driving force in the kaizen process. This entailed that any member of staff could put forward a suggestion and if it was accepted then it would be implemented. There was a case that a person put forward a suggestion for placing plastic bags as separators instead of cardboard in the packing stage. This worked out to save the company £1703.52 per year. The employee would get rewarded for this CI of 50% of the yearly saving and the team leader TL would get 10% of the saving. This type of incentive worked well on both the company and the employees.

CI and kaizen are concentrated on waste removal, and this company changed its export packaging from cardboard to solid foldable frames. These were then returned from the customer and reused, saving both money and reducing waste in the process.

Implementation:

The implementation of CI in this company was driven by top management and after the pilot program they realised that the whole workforce needed to be involved to make the process work.

They used systems like SPC which measures the quality of the parts on a regular basis and highlights errors before the become rejects.

The use of Quality Circles QC's in this company helped both management and operators to work together for the same goal. It was difficult at first for the workers to be in a group, which contained management, however the process help the company with some very valuable improvements.

2.5.3 Case study 3 CAMI

Profile:

CAMI is a company based in Ontario, Canada, it started operations in 1989 and produces small utility cars/jeeps. North American and Japanese partners jointly own this company. The workers are part of the Canadian Auto Workers union CAW. The Japanese have a large influence in this organisation, such as no designated car parking and Japanese words in locations around the factory. It is through this Japanese influence that they used a form of Kaizen/suggestion scheme called Teians. These Teians are a system for generating and implementing employee ideas

Outlook for Kaizen:

This company has 2300 employees and the reason the company chose to take part in Kaizen is to be able to compete with their competitors in the car manufacturing industry, of which they have 26. One manager described the reasons Kaizen is required was, " *..we need the ideas of every individual on the floor. Otherwise, we're not going to be able to make it down the road.* " This feeling has helped the change process.

The CAMI factory started with a blank canvas, and had no previous conditions, it was possible to implement kaizen from the start, in fact the company is very Japanese as they encourage morning exercises at the start of each day.

CAMI does not rely on industrial engineering departments to solve problems. They use QC's and Teians to solve the majority of issues. The rationale behind this is that the workers at the coalface know the job better than anybody else and are hence in a much better position to correct or find any errors or improvements in the process.

Processes used to achieve improvements:

There seemed to be some pressure used to ensure that the staff produced the minimum amount of suggestions/Teians per month. There was also incentives used to ensure that Teians were put forward. Each Teians was worth $0.50 and if accepted it was worth another $0.50, the team with the largest amount of Teians in the month were given free Pizza. There was further incentives given to the best suggestions each month for a gold, silver and bronze awards, they were awarded by the company president, which showed that the suggestions were considered to be top priority.

The Quality circles were called Quality control circles QCC's each team was encouraged to meet and discuss issue attaining to their work, however they were to hold these meetings on their lunch break. $1.00 was given to each member for attending the QCC's.

Implementation:

The implementation of the process seem to be very rewarding for the company, CAMI stated in 1990 that they saved $10.8 million by these Teians. However analysis by union officials doubted those numbers. In one of the examples given a tool was kaizened and improved, but later when the tool ran at full speed the tool broke. The unions said that the management calculate the proposed saving rather than the actual savings. A company representative said that even if the Teians proved not to work, that this did not matter, as it was the though process that is what mattered. Once people had the mindset of improving things, then the Pygmalion effect would come true.

There was general discontent when workers began to realise that when an area was Kaizened- made very lean, teams may have been reduced from 5 to 4, the other person was meant to be a floating person to aid all people involved. However when the management began to take this person away to help in other areas of the factory, people felt cheated and over worked.

The union had at this stage told members to reflect on each kaizen before submitting it, that those seconds of waste should be held onto because they were hard earned, and not to let the management force them to squeeze those seconds out of their members.

There was also 4 cases of repetitive strain injuries RSI in one team of 14 people. In regard to QCC's many people felt pressure to attend these meetings, even though they were part of their half-hour break. If they did not attend at least one a month, one workers said ' ..there would be trouble..'. Some QCC's became a target for the workers to bring better work rotation for themselves rather than for the good of the company. It was also suggested that people held the QCC's because they had to and just used it as a way of making an extra $1.00 on each meeting, and discuss nothing of importance.

Notation:

It must be noted that the case study above was sponsored by Labour Canada and the union CAW.

CHAPTER 3

RESEARCH MEDTHODOLOGY

This chapter describes the research methodology used within this dissertation. The method of collection of data will be explained and why the choice of questionnaire and case studies were used as a basis for this study.

Saunders et al. describes research design, as an onion with different layers to uncover as each process is unpeeled. The first layer being the research philosophy, the second is the subject that is used in the research approach and next is the research strategy followed by the fourth layer of time horizons *(Saunders et al. 2007)*.

The method of triangulation is used in this study to gather data from different sources to provide a stronger representation rather than just one source. *Kane et al.* describe triangulation "…triangulation is where you use one or more techniques to get the same information." *(Kane et al. 2005 p.144)*. Saunders et al. suggests that triangulation is used within a study to ensure the data is telling you what you think it is really telling you *(Saunders et al. 2007 p.139)*.

3.1.0 Reason for the study

The reason for this study is to examine the difference between Japanese concepts and the introduction of these concepts into a western business. The study will highlight whether the Japanization can be implemented in an Irish/western style company. It will also analyse what problems may be encountered and how to overcome any such difficulties.

This study should help other firms of similar background to adjust and plan for the merging of cultures and ideas. Using both primary and secondary research it has developed this subject into a more cogent explanation of kaizen and the forces which come into play when introducing such systems.

3.1.1 Research design

The research types undertaken are primary research and secondary research. The primary research is done using qualitative research in the form of questionnaires. The questionnaire has twelve questions and uses the Likert scale method, which grades in levels of strength in regard to the person's answers. The Likert scale asks the respondent how strongly they agree on the statement on a points rating scale *(Saunders et al. 2007 p372).*

There was also a comment box at the end of the questionnaire, where each respondent could give additional information.

The secondary research is carried out from an analysis of Literature review along with the three case studies which are relevant to the theme of this dissertation. The case studies will look at three areas within each case and they will be examined in-depth.

The triangulation of data from these three case studies is used to analyse the implications of Kaizen introductions in each company, this is also related to the Irish company, Neriki.

3.1.2 Primary Research

Primary research is the collection of data that does not already exist *(Saunders et al. 2007)*.

Questionnaires were used in this study as the primary research to understand how Kaizen has impacted on the company as a whole and to determine if the implementation of Kaizen is possible outside of Japan.

The company used in this study is Neriki Europe, which is based in Ireland and is the first company to extend from the mother company based in Japan. The company manufactures high-pressure gas valves.

The questionnaires were given to three hierarchical levels within the company, which ensures a broad spectrum of opinions.

The three levels are:

1. Senior management

2. Middle management

3. General staff

Access to these participants was obtained with the agreement of the management within Neriki Europe. The administration of the questionnaires was by hand and returned to a specific location within Neriki, thus ensuring anonminity. There were 17 questionnaires handed out and 15 returned, which was an 88% return.

3.1.3 Secondary Research

The secondary research in this study is comprised of the data collected in Chapter 2, the literature review and three different case studies: Dieselco, a Radiator manufacturer and CAMI.

Chapter 2 has given a detailed account of many of the processes used in Kaizen. It has also developed and analysed the different areas that cannot be excluded from such analysis of the subject, such as culture and organisational design.

Case studies are a very useful form of analysis as they are chosen for their real life comparisons, which use multiple sources of evidence (*Saunders et al. 2007*).

The particular case studies were chosen due to their similarity between each other and the likeness to the Primary research company, Neriki. All companies use the system of kaizen in their organisations, however some chose to call it Lean manufacturing or continuous improvement program. Each company also use systems as described in chapter 2 such as QC's, JIT, Kanbans, suggestion schemes and the elimination of waste.

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Kane et al. suggests that case studies help the reader to understand "..why and how something works in real life." *(Kane et al. 2005 p.277).* Robson defines case study as "..a strategy for doing research which involves an empirical investigation....within real life context.." *(Saunders et al. 2007 p.139).*

The analysis of this combination develops further the view of Kaizen and the Japanization within western companies.

3.1.4 Limitations to research

The limitations to the questionnaire were the quantity of people within Neriki to choose from. As the company has only fifty employees it is relatively small. Within that, the breakdown of three different groups narrowed the study down further. However the benefit of this small size was the closeness of the employees to the process. There were no limitations to the access of people within the organisation. With questionnaires which are dropped off, there is little control of the respondent and they may have had help from others when completing the form *(Kane et al. 2005 p.229)*.

Neutral responses can be a problem when using the Likert scale, by choosing the ' Neither agree or disagree' answer *(Kane et al. 2005)*.
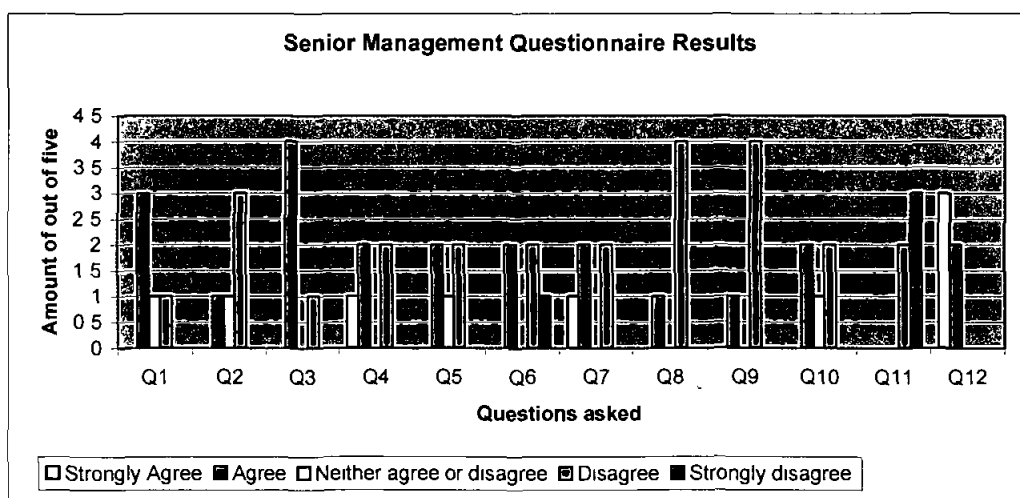
In regard to the case studies, the limitation to this form of analysis is that it does not exactly match with the case in hand and each study can focus on different areas within each case. Therefore it was important for this study that each case was broken down into three sections.

CHAPTER 4

FINDINGS AND ANALYSIS

The questionnaire, which was divided into three sections within Neriki, was done to ensure that there was a broad spectrum of opinions analysed. The questionnaire is in appendix 1 and it contains all the questions numbered in the tables below.

The senior management findings showed that most understood Kaizen and what it meant to them and the company as a continuous improvement process. There were strong reservations on whether Kaizen would work in Neriki as shown by Q3 – 'will it work in this factory'? Nevertheless they still found that the process was worthwhile. There was mixed opinions on questions 4,5,6 and 7 however questions 8 and 9 (seen in table 1) showed that there was some negativism about allocated time and feedback from their proposals. It can be highlighted that the senior management felt that it would not be easy to implement in Neriki as shown be Q11. This analysis can be established from the tables below and the actual questionnaire given in appendix 1.

Senior Management Questionnaire Results

□ Strongly Agree ■ Agree □ Neither agree or disagree ▣ Disagree ■ Strongly disagree

Table 1 Senior Management Questionnaire Results

The middle management showed completely different results to the senior management sample. There seems to be a higher agreement to most of the questions put to them, however on Q6 in relation to uniting the company there was general indifference to Kaizen uniting the company.

The differences between the middle management and senior management seems to be that the senior management felt that it was hard to implement and were reserved about if it would work in Neriki. However this impression must not have been translated down to the middle management. Which may show that even though the senior management may not truly believe in the implementation of Kaizen in Neriki, they fulfilled their managerial roles by motivating the middle management to believe in the process, without letting their own emotions cloud their judgment. However, this was noted by one person in the middle managements comments section on the questionnaire. That person did feel that the senior management had a different opinion on the kaizen process. The person also felt that rather than the kaizen programme using some or all of the functions necessary within kaizen, such as JIT, QC's, TQC etcetera it appears that it did not use these processes. Kaizen was noted also within Neriki as the old suggestion scheme renamed.
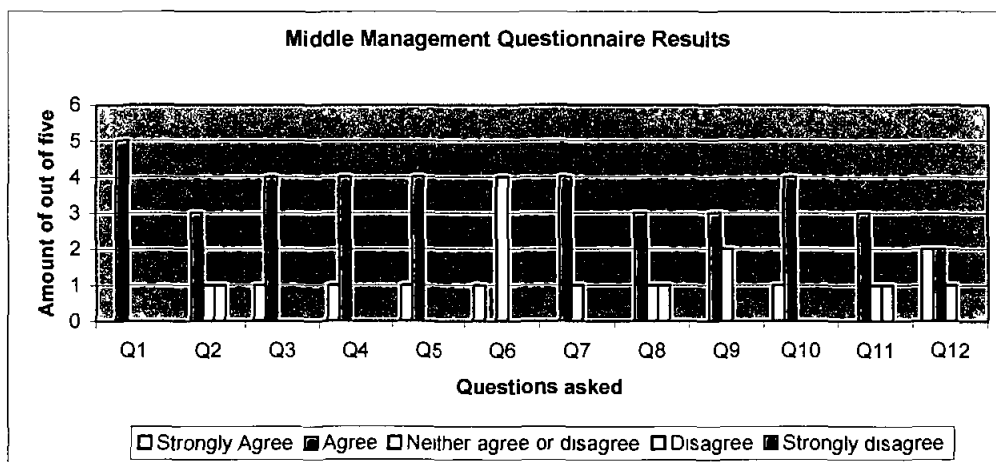
Table 2 Middle Management questionnaire results

The general staff again showed large differences to the questions posed to them, in relation to the other areas of senior and middle management. Here it was seen that half of the staff did not understand Kaizen or if continuous improvement was the same thing. There were more mid-point answers chosen, which may show that they either did not understand the statement or they just had no opinion on the statement. Kaizen seems less important to the general staff than management and there may be some apathy around the area of Kaizen. There was more than half of staff who stated that they were not given time to participate during work hours.

Kaizen must have had some impact on the staff as a majority chose agreement with statement Q10 that it did in fact change the way they thought about their job. In regard to implementation there was again a majority who thought it was not easy to implement Kaizen in Neriki.
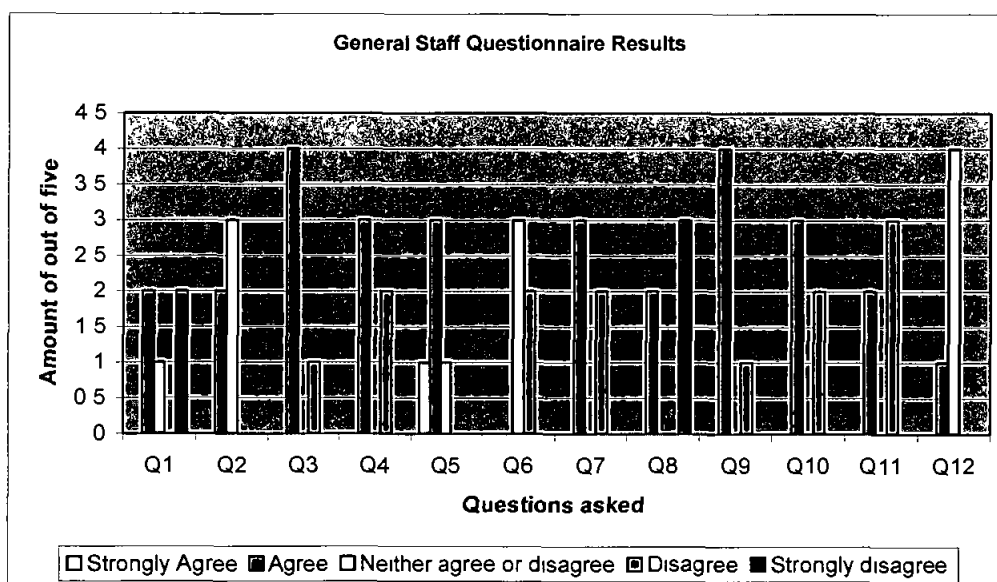
Table 3 General Staff Questionnaire Results

This analysis between these three levels within Neriki has shown that there are large differences between each area and it seems that the middle management believe in the process of kaizen more than the senior management, however they are having trouble transferring that knowledge or motivation to the general staff. From the data it may be that the general staff see themselves as just workers and not part of the company as a whole.

The three case studies which were analysed all had similar stories throughout the Kaizen process. The main reason for many of the companies to under take the kaizen process was the increased competition within their industries. If the companies studied did not undertake these kaizen style programs they may not have been able to survive in the marketplace. Dieselco originally implemented the improvement program with management, similar to VRM. Both realise that having the management knowing about this system was not good enough for the true implementation of these programs. The concept of the Kaizen and CI are to involve each and every member of staff in the continual improvement of their area.

CAMI was the only company out of the studies, which started the program from the beginning of their operations. This had the benefit of not initiating a new system therefore the concept was natural to each employee because it begun the moment they started working for the company. This system was accepted as a new style of working, as it was partly owned by the Japanese. This company had a greater use of most of the Kaizen principles laid out in chapter 2. They really concentrated their efforts on the Taylorism, which used classical approaches to management. CAMI could be easily labelled to be of the Mediated Japanization II as suggested by proctor et al. and Oliver et al. in chapter 2.

The processes each company used were different sometimes in name only, such as the QC's in CAMI they were called QCC's and Dieselco and VRM omitted the word Kaizen in their approach. VRM and CAMI used the suggestion scheme to great effect especially CAMI. The system in CAMI was very detailed and staff had to make suggestions, called – Teians.

However as seen in the CAMI study the system had got its critics, the unions and some of the staff were very wary of the methods used to obtain Teians. There must be a minimum amount each month per person and the payment reward system was open to abuse on both sides.

The implementation of the kaizen systems in all companies seemed to be a resounding success, Dieselco saved £2 million, VRM report savings on individual projects and CAMI released figures to state they saved $10.8 million dollars. Again it was noted that in the case of CAMI these so called savings were not exactly tangible savings, they were proposed saving, worked out mathematically by adding all Teian savings. This led the unions to be sceptical of such savings.

Each company studied did stress that Kaizen was the way forward in a challenging market, and when competitors are doing things which improves their efficiencies then one must follow or if necessary take the lead in these areas.

As seen from chapter 2 there are many facets to the Japanization of companies outside of Japan. Ouchi's Theory Z approach would be seen by the companies studied to be the way forward for them. However each company has seemed to pick the factors that they like out of the Japanization concept.

A common thread running through the companies above are that they all wish to improve their processes and they have chosen the Japanese concept as the way forward in today's economic climate.

CHAPTER 5

CONCLUSION

This paper has reviewed the material on the Kaizen process and has examined the Japanization concepts surrounding the mystery and success of Japans use of these tools. As seen from chapter 2, Japan did not invent nor create the principles outlined in chapter 2; they were developed in America and other nations. The difference was Japan took these concepts and used them to the best of their ability, so much so that anecdotally people in the west have believed that they are Japanese principles and labelled it Japanization.

The case studies examined have given a detailed outlook and perhaps a model for Neriki to embrace, copy or disregard.

The senior management within Neriki have started this process, yet there seems to be some question about the belief in the Kaizen system. They have successfully transferred the positive aspects to other sections within the company on the Kaizen process, but there is a thread of doubt within the ranks of the middle management. As seen from the case studies management drives the Kaizen process, and momentum with good leadership is required to be kept up in order for the process to be successful. Using kaizen to help the company be innovative is especially significant as seen in the case studies outlined.

CAMI has seen some dissention from the staff as the method used to achieve higher productivity. This company has highlighted that the Mediated Japanization II as suggested by Proctor et al. and Oliver et al. is creeping into the company. Neriki would do well to learn from this situation and build a more positive situation and aim for the Direct Japanization. Companies need to be aware of the cultural differences and adapt the process to suit their culture.

The questionnaire findings were very interesting, in that it showed the differences between management levels. This is the one area that Japan has a little advantage over western companies. In relation to collectivism as discussed in chapter two, the Japanese think of the whole company and are less concerned about their individual needs. This is not to say that it is impossible to achieve collectivism in an Irish company, however it highlights that it is something companies would have to address to ensure unity.

This unity needs to start at the top of the organisation and strong leadership can bring a company together. In relation to the case studies; in all three companies there was the leadership from the management to drive the kaizen process throughout the companies. Neriki can take from this an example of how to continue the process of Kaizen.

RECOMMENDATIONS

Further studies could be undertaken within Neriki to establish the degree of Kaizen implemented with a detailed case study of the company, which could develop more of a holistic view of the company.

As the company is only setting up the kaizen concept at present it will be interesting to see with further research how this process adapts to the challenges as highlighted in this paper.

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Questionnaires

Completed questionnaires available upon request.

Appendix 1

Questionnaire

This questionnaire is part of a research dissertation carried out in part fulfilment of a Ba Honors in Business at the National College of Ireland NCI. This research aims to examine Kaizen and its impact within this organisation.

This is an anonymous questionnaire and any information collected will be kept strictly confidential and is only for the purposes of completing my dissertation.

How to fill out:

Read each question and then circle one of the numbers 1~5 based on your opinion. Please answer all questions if possible.

There is a comment section at the end if you wish to write addition information, which is optional.

Note:
It should take less than five minutes to complete.

Please return your questionnaire to:

Paul Mc Cormack, Neriki Europe, Bray Business Park, Bray, Co. Wicklow.

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Dept:_____ **Date:**_____

Q1. Kaizen has been clearly explained to me.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q2. The recent introduction of Kaizen will work in this factory?

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q3. Taking part in Kaizen is worthwhile.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q4. The success of Kaizen in this factory is important to me.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q5. Kaizen will help me in my job.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q6. Kaizen has helped to unite the whole company.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q7. I participate in Kaizen on a regular basis.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q8. I am given time during work to participate in Kaizen.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q9. I get feedback on my Kaizen proposals.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5 Strongly disagree

Q10. Kaizen has changed the way I think about my job.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q11. Kaizen is easy to implement in this company.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Q12. Continuous improvement and Kaizen are the same thing.

1. Strongly agree
2. Agree
3. Neither agree nor disagree
4. Disagree
5. Strongly disagree

Comments (Optional) :

_____

_____

_____

_____

_____

_____

_____

Strategic and HRM aspects of kaizen: a case study

Hedley Malloch

This article presents a case study of a kaizen in a UK diesel engine manufacturer. Kaizen is explained as an emergent strategy; its effectiveness in reducing costs is explained by its effects on the effort bargain and by the organisation of the work standardisation task. Kaizen-related changes, perceptions of the employees, and its effects of the competitive position of the firm are reviewed.

The aim of this article is to describe, analyse and evaluate a case study of how a kaizen strategy was managed in the UK operations of Dieselco, a large multi-national engineering firm making diesel engines, over the period 1990–96. The article shows how:

- the kaizen strategy was formulated;
- the kaizen function was organised and resourced;
- kaizen supported increased operational efficiency through the management of the effort bargain and cost effective standardisation of work tasks;
- the strategy was implemented and its organisational consequences;
- kaizen was perceived by the managers and employees.

The article defines kaizen, indicates its significance and outlines the methodology. The case is presented, and selected strategic and human resource management issues are analysed and evaluated.

❑ Hedley Malloch is a Principal Lecturer, School of Business and Management, University of Teesside.

What is kaizen?

Kaizen has been defined as any process of continuous improvement in any arena of life: personal, social, home or work [1]. The process is often seen as being underpinned by a philosophy which regards the struggle for unending improvement as a desirable and harmony inducing end in itself.

Although it is usually discussed as a technique supporting total quality control or just-in-time (JIT), it can support any management activity including cost reduction [2]; time management [3], safety management [4], product design, productivity improvements, zero defects, maintenance management or new product development. Continuous improvement can mean waste elimination, innovation or managing new standards. The kaizen process can draw on any management tool including suggestion schemes, small group problem-solving, statistical techniques, brainstorming or work study. Its target can be manufacturing, maintenance, suppliers, management systems or administration.

This multiplicity of methods, ends and contexts means that kaizen is highly polyvalent both as a concept and a technique. This article is a study of an organisation

where kaizen came to mean a type of continuing improvement in the shape of formal systems and procedures for analysing the work of assembly line operators with a view to eliminating what managers saw as 'wasted human effort'. The reduction of 'wasted human effort' in Dieselco's assembly operations was achieved by removing the 'unproductive' use of operators' time spent waiting, or in unnecessary operations, motions or movements. The aim was to produce more engines with a reduced labour input per engine.

Thus kaizen can be seen as an element of a continuous improvement strategy. But in Dieselco kaizen was that part of continuous improvement which most affected the work of assembly operators. For them kaizen came to mean continuous improvement.

The importance of kaizen

For many writers kaizen plays a central role in the success of 'new wave manufacturing strategies' [5]. Imai describes it as "the single most important concept in Japanese management" [6]. Oliver and Wilkinson note that for many commentators kaizen "is *the* distinguishing feature between Japanese and Western organisations' (italics in original) [7]; for Conti and Warner kaizen "sums up the features we associated with Japanese management" [8]. Sengenberger and Campbell argue that kaizen is one of the principal features of lean production; indeed, for them the objectives of lean production and many kaizen programmes are identical: the avoidance of waste [9]. Williams et al. identify a management preoccupation with the calculation of work within a culture of kaizen as the main means by which Japanese car firms are able to reduce labour and control labour costs [10]; Bertodo claims kaizen as a reason why Japanese manufacturers are able to manage quick productivity and quality breakthroughs, and as a key component in a turnround strategy [11]. Others who have taken up these themes include Webb and Bryant who advocate the widespread adoption of kaizen as a solution to the declining competitiveness of American manufacturing firms [12]

Despite its importance and interest, kaizen has attracted relatively little attention Some of the major texts on lean production systems mention it only in passing [13]. There have been few case-study based accounts written

from an organisational and strategic perspective of how kaizen has been developed in UK firms who have adopted lean production systems. This article aims to help fill that gap.

Methodology

The data presented in this paper were gathered as part of a larger study aimed at tracing the development of a lean production system into two United Kingdom factories of a large manufacturer of diesel engines over the period 1989–1996. The research design was:

- Forty interviews with personnel from both factories drawn from the manufacturing, engineering, marketing, human resources, supply and procurement, shipping and quality functions. Job titles included directors, plant managers, middle managers, supervisors, shop floor, office and administrative personnel. Included in the interview sample were the convenors in each plant of the Amalgamated Engineering and Electrical Union (AEEU) and the Manufacturing, Science and Finance (MSF) unions. The interviews were semi-structured, tape-recorded and focused on how the shift to lean production had affected the interviewee's job over the period of the study.
- An inspection of relevant company documentation.
- Guided tours of both factories.

The data were gathered between May and July 1996. At the time of writing (August 1996) a section of the data has been fully analysed, but the remainder has not. Therefore the evaluation and conclusions presented in this paper must be regarded as tentative and provisional.

The evidence is presented in the form of a case study written at company level embracing the experiences of two plants located over 150 miles apart. There were distinctions in how kaizen evolved in each of the plants and how it was organised. Attention is drawn to these variations where they were important.

Kaizen in Dieselco

The diesel engine industry

The diesel engine industry was marked by great diversity of producers and markets. Producers were divided into two types:

integrated manufacturers, such as Volvo, Ford and Caterpillar, making diesel engines to fit their own equipment; and loose engine makers, like Dieselco, selling to a variety of customers and industries.

The competitive conditions in the diesel engine industry over the period of the study were not good. Competition in the industry had intensified as buyer power had increased. Customers demanded better performance measured by higher horse-power, lower cost and improved compliance with rising environmental standards. Buyers had reduced in number as many users had moved toward contract hire, and traditional boundaries between loose and integrated manufacturers were eroded as integrated manufacturers sold their excess capacity into markets which historically had been regarded as the preserve of loose engine makers.

Markets were characterised by diversity. Buyers were international: national rules on emissions and road speeds, and factors such as traffic density and the quality of the national road system meant that engine settings and components had to be precisely tailored to comply with local requirements. Diesel engines had a multiplicity of end uses in transport (buses, trucks, locomotives, marine); power generation, extraction, and construction equipment each of which demanded different performance characteristics requiring tailored fuel, cooling, exhaust, electronic and lubrication systems. Finally, individual customers' requirements could determine the precise nature of fits and finishes of all aspects of engine configuration down to the exact location of the dip-stick.

These buyer-driven forces reached particularly intense levels in the UK operations of Dieselco. In other markets, especially North America, Dieselco used their brand name to counter rising buyer power. But in European markets the Dieselco's brand reputation was weaker and as a consequence Dieselco's UK factories were required to customise to a greater extent than their North American counterparts.

The management of variety foreshortened product life cycles. One technical operations manager commented:

> We have been able to go through several emissions changes without a fundamental engine re-design But you get to a point where you have to re-design the engine, otherwise there are too many compromises with power, torque, speed, throttle response

or fuel consumption all those things are compromised ... you reach a point where a new engine design is necessary

It was estimated that in 1996 a new engine design would have a guaranteed product life of four years before it was overtaken by an ever-rising tide of emission control standards and need for lower costs. New engines were expensive to develop. The research and development costs for a new engine could be $200 million, a big component in what was a high fixed cost business. Unit fixed costs were controlled by output: the higher the engine output, the lower the fixed cost per engine. Firms making diesel engines in 1996 not only had to manage problems of diversity and range. They were required to produce engines in large volume. Plant output became a highly important variable in Dieselco's strategic equations.

Dieselco

Dieselco was a leading multi-national firm of loose diesel engine manufacturers, with its headquarters in the USA, and manufacturing facilities in over 30 countries. It covered all segments of the diesel engine market and competed on a strategy of broad differentiation based on quality as defined by performance, reliability, service and reputation [14]. In the four years up to 1989 the UK-based operations of Dieselco recorded losses of over £50 million, a performance which mirrored the deteriorating position of Dieselco as a whole. It was against this backcloth that Dieselco took the decision formally to embrace the principles of lean production as an integrated coherent package.

Lean production in Dieselco

The lean production system was introduced into Dieselco in 1989 and reached its UK plants about a year later. It appears to have been modelled on the Toyota Production System [15]. Its principal features were:

● A statement of five principles stressing commitment to customers, quality and human asset development.
● Ten common practices to be followed in all Dieselco's units. These included synchronised flow production, the primacy of the customer, capable processes, a commitment to functional excellence, built-in quality, partnership with sup-

pliers, employee involvement, the creation of an environment in which quality and productivity could flourish and a general commitment to use problem solving and continuous improvement processes.

● A commitment to continuous improvement through waste elimination and variety reduction through the creation of common practices, a common approach to problem solving, a common improvement process, common measurements and common training.

These principles, practices and processes were supported by an impressive array of amply documented planning, audit, and highly visible measurement systems to be followed by plants and functions; the creation of a myriad of cross-functional committees, groups, task forces and new posts to ensure co-ordination; and extensive efforts to involve employees at all levels through training and communication.

The most striking feature of the continuous improvement strategy launched in 1989 was the absence of any mention of kaizen. At this time there were two continuous improvement techniques commended to plants: a seven-step problem solving process, a generic methodology which could be applied by groups or individuals to a wide range of problems; and a common approach to continuous improvement (CACI) which tackled improvements using systems concepts (inputs, throughputs, outputs) targeted at problems at departmental or plant level. Kaizen, as a systematised approach to removing 'wasted human effort' through systematic work analysis, does not feature in any of Dieselco's documentation until 1994, by which time kaizen was already well established in Dieselco's UK plants. The initial omission of kaizen from Dieselco's managers' considerations was not an oversight. When lean production was first launched in Dieselco, senior managers did not consider kaizen to be suitable. There appear to have been two reasons for this perception. Firstly, managerial awareness of kaizen was patchy; secondly, it was considered to be a risky strategy in terms of employees' reactions at a time when managers were anxious to achieve a successful launch of the new lean production systems.

Dieselco's UK plants

The first engine plant in the study was located in Bilchester, an industrial town in northern England. Its strategic position was less than ideal. The Bilchester plant was one of ten Dieselco plants which made six-litre diesel engines mainly for the fiercely-competitive European bus and truck market. It had one customer who accounted for 20% of the plant's output, with the balance sold to a large customer base many of whom bought less than 10 engines per year. The plant worked under full capacity, producing under 200 engines per day, spread over 5000 specifications. Over 500 people were employed in the factory in 1996.

The second plant was at Ebworth, a town in the Midlands. This factory made over 3000 engines a year in the high horse-power 38–50 litre range. In 1996 it was a very profitable plant, employing 650 people in the workshops and offices.

Although strategically different the plants had many functional similarities. By 1996 both plants were assembly operations; Bilchester had divested its manufacturing facilities in the 1980s and Ebworth subcontracted its machine shop in the early 1990s. The move to synchronous flow production had meant the introduction of flow line production methods, a process which had not been completed in either factory by 1996.

Dieselco enjoyed a reputation as an excellent employer offering very good terms and conditions of employment. Finally, both factories were unionised with the AEEU and MSF representing the shop floor and office staff respectively. Industrial relations in both plants were good, but quite robust. The trades unions generally accepted the need for changes embedded in the new lean production strategies, but were prepared to bargain hard over implementation issues. The plants' history included the use of sanctions in pursuit of claims. The climate in both plants had inevitably been affected by Dieselco's decision announced in 1996 to close a third UK plant.

The development of kaizen as strategy formation

Kaizen and the reduction of takt time

The central problem in Dieselco which kaizen was used to solve was how assembly oper-

ations were to be changed to accommodate a steadily reducing takt time. Takt time is very important in lean production It is the heartbeat of the lean production factory; the pulse-rate of synchronous flow manufacturing and JIT. But takt time is not well understood and it is therefore appropriate to clarify the concept. Takt time is a customer determined cycle time. If customers demand 30 units an hour, then the cycle time—the time interval between successive process outputs at any work station on the line must be 2 minutes. The interval between items coming off the end of the line has to be 120 seconds [16]. Takt time is a function of the required output: it is order-book driven. It differs fundamentally from other approaches to setting output targets, such as a standard time, which is the amount of time necessary to complete a task taken by competent employee working at a standard level of effort.

Standard times are based on some system of work measurement and are therefore essentially process or input driven. Takt times and standard times meet when manning calculations are made. For example, with a desired output of 30 an hour, takt time will be 2 minutes. If the total standard time to assemble the product is 50 minutes, then a minimum of 25 workers will be required. If kaizen reduces the total standard assembly time to 40 minutes then the minimum workforce falls to 20, with takt time remaining at 2 minutes for the desired output.

Takt times are used to determine how many tasks a worker will perform and how many people will be required on the line. Conceptually kaizen and takt times are independent. Kaizen improvements can be carried out with reference to takt times, and takt times are determined by the order-book and not by kaizen improvements. But in practice in Dieselco both takt times and headcount were continually reducing the period of the study as managers sought greater throughput and more efficient use of labour. Added to these considerations was the stream of changing demands from product markets for customisation of engines. Taken together they paint a picture of both managers and assembly workers engaged in an unending round of 'rationalising' workers' tasks in order to do more with less. Kaizen came to be seen as essential to the management of this process.

The emergence of kaizen

In 1989 there was no mention of kaizen in the extensive documentation and videos which launched lean production into Dieselco's UK operations. Instead there were references to two other techniques of continuous improvement, seven-step problem solving and CACI. By 1996 kaizen was employing the full-time services of 12 people at Ebworth and 16 at Bilchester. In addition 70 shop floor operators have been trained in kaizen in the Bilchester plant. Between 1992 and 1996 over 300 kaizen projects had been implemented in with savings conservatively estimated at over £2 million. Seven-step problem solving was effectively absorbed into the kaizen process and CACI was seen as a method of continuous improvement which was appropriate for office work. By 1996 kaizen was the dominant method of continuous improvement in Dieselco's internal operations

The development of kaizen in Dieselco raises fundamental questions of how some lean production strategies are formulated, emerge and are implemented. Much of the literature on lean production [17] gives the impression that these strategies are the product of careful reflection, rational analysis and implemented in a planned linear manner commonly described in many strategic management texts [18].

The reality was much more complex in this case. The history of kaizen in Dieselco's UK plants showed a 'messy' process, with key stages in its rise having a serendipitous nature. Its effectiveness as a continuous improvement strategy appeared to depend as much on the presence of a strong organisational myth as on a carefully considered implementation plan. There were four strands in its growth. First, both plants reorganised their manufacturing facilities during the early 1990s. Some shop floor and office staff were released and re-organised into 'continuous improvement teams'. This redeployment appeared, at least in part, to have been due to a desire by management to avoid redundancies at a time when lean production was being introduced. This re-organisation created the resources for kaizen.

Second, the continuous improvement teams were given some training in kaizen by the Kaizen Institute of America (KIA). The model of kaizen offered in the training bore little resemblance to what followed Recalling their experiences many of the participants

were quite critical of the training and the view of kaizen offered by KIA. One remembered:

> We had a five-day training course. The first day was classroom work, and then we went out on the shop floor in groups of five or six and we did a project I don't think that the KIA had any idea of how kaizen should be run   They did not go into enough detail on the analytical side of it—how you do the charts and the statistics I would say at the end of the first week 75% of the people   did not understand it. They knew what it was, but they did not understand how it worked.

The consequence of the KIA training was to sensitise the continuous improvement teams to kaizen: from this point the word kaizen entered the vocabulary of continuous improvement at Dieselco. But understanding came from another source—a link with Osaka Engines.

The Japanese influence

Osaka Engines was a Japanese producer of small agricultural diesel engines They took a share in Dieselco in the late 1980s to acquire Dieselco's expertise on emissions controls. In return they offered Dieselco consultancy on production management. The third strand in kaizen's development was when Osaka's engineers visited the UK plants in 1991–2 to help with new plant layouts. They worked with the newly-formed continuous improvement teams using kaizen as one of their techniques. The effect of this direct exposure to kaizen, as employed by Osaka Engines, on Dieselco's continuous improvement teams was considerable. One recalled:

> There were two Japanese blokes here working on the new automatic guided vehicles lines. They showed us how they used kaizen The Japanese were much more focused and aggressive than the KIA Everything—but everything—that did not add value was seen to be waste and had to be removed. They changed our mindset The attitude was 'here is a stopwatch: go out and measure waste' They gave us some kaizen projects We did them and showed them what we had done. They did not say anything—they just smiled and nodded

The fourth strand in the evolution of kaizen was the training given to the continuous improvement teams by Osaka Engineering in one of their factories in Japan. This was the source of a powerful kaizen myth in Dieselco, a story recounted to the researcher by Dieselco's people whenever the subject of kaizen

was raised. One of Dieselco's staff who participated in the training told it:

The kaizen myth

We went over there and that is when I learned what kaizen was really about The   first morning, they took us all out to the shop floor There was a small block-line where they made very small engines, like a lawn-mower engine There were 24 machines laid out like this (draws plan of line on paper)

1 metre approx

Key

→	Direction of flow on the block line
▓▓	machines
⚲	operator
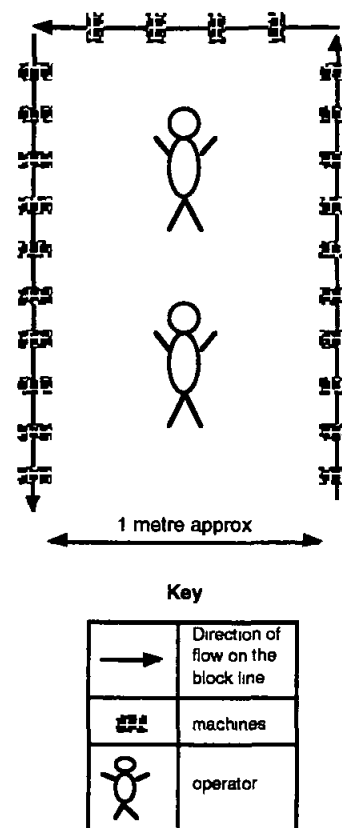
Figure 1: Plan of the engine block line

between these machines in about one metre of space was just enough for one man to work They had two people working the line. one went up one half as far as he could work; the second one finished off the process The kaizen leaders told us: 'For the next hour study everything that happens on the line, then see what elements of waste you can find'.

Well, we were amazed The block-line was running like a Swiss clock For the first forty-five minutes we just stood there with our mouths open Then they started to prompt us a little In the last fifteen minutes we did come up with some elements of waste that we thought we could improve The trainers said that we should always

go out and study the job first to see if you can pick up elements of waste, for example, if a man is walking too far, or if he is bending too much. They gradually led us into that way of thinking. Then they showed us how to record work on a video; they said we should record all motions
Next they showed us how to record these motions on a standard work combination chart They took us through each step in the process breaking each work element down into seconds As we started to do these charts it became so clear how the process worked and showed we could pick out all the elements of waste. It told such a story—it was incredible They showed us how to draw the capacity by process charts There were 24 machines, you would take the elements and put them into a bar chart Everything was worked on a takt time and we could see which parts of the process were within the takt time We could see as the engines travelled which parts of the process were within the takt time or close to it, or without it. Then we looked at the process and tried to balance the work between processes, balancing the line around the takt time
The goal they set us was to get down to one man on the line instead of two Now the block line was churning out an engine block every 243 seconds. We had to cut that down by 100 seconds. We found about 40 seconds . they had already found about 80 seconds, but what we found brought them up to target, because we found bits that they had missed
We made all this new equipment Some of it we installed in the line, some of it did not get delivered until after we had gone We got a message back from them the week after we had left saying that the parts had come in and that the goal had been achieved

This story is important for two connected reasons. First, numerous writers have pointed out the importance of organisational stories such as this one in times of great change Weick argues that they can be an important means by which organisation members can understand new and unexpected problems and opportunities, to help to make them more manageable [19]. Wilkins identifies stories as symbols which control the organisation [20]. Second, the story offers kaizen as a socially-constructed reality [21]. As Goodall argues that:

Socially-constructed realities allow employees and managers to develop rites, rituals and routines, and to co-ordinate activities towards the accomplishment of organisational objectives [22]

Meaning is particularly important to an idea such as kaizen which exists both as a philosophy and also as polyvalent management process. The kaizen myth gave kaizen in Dieselco its meaning: it permitted some level of shared understanding of how kaizen was

to be implemented and about its ends. If the myth is deconstructed then the salient features of the kaizen system in Dieselco are laid bare. The principal messages from the deconstructed kaizen myth to Dieselco members are shown in Figure 2.

This is what kaizen came to mean in Dieselco. Support for this view could be found in how members of kaizen teams described their jobs in 1996. One participant described how although kaizen had been used on projects other than those of reducing effort and time, such as quality problems with dented fillers, burned hoses and faulty materials, by 1996 all the work was in effort management. He commented:

The big re-focus this year has been to get 16 engines an hour, to understand which operations are over 203* seconds and to get them down Kaizen lends itself to this· it's all about people performing work Some of the other techniques such as seven-step problem solving and common approaches to continuous improvement might be better for quality and product defects We want to be where there is a people element of work

- kaizen is portable between organisations
- the reduction of unnecessary human movement is essential to waste elimination
- complex tasks can be analysed by simple paper-based systems
- waste can be measured in seconds
- impressive reductions in waste are possible even in the most tightly-regulated and apparently well-managed environments
- the study of waste elimination can be systematised and programmed
- most people can be trained to implement kaizen

Figure 2: The kaizen myth deconstructed

* The statement suggests a possible misunderstanding by the respondent as to the calculation and meaning of takt times With a takt time of 203 seconds hourly engine output should be 3600/203 or 17 7 engines per hour and not 16 as stated. This may be an arithmetic slip on the part of the respondent, or a sign that the text-book method of calculating takt times was either not fully understood, or applied

The significance of the evidence presented here is that it suggests that kaizen could be seen as an emergent rather than a planned process with elements of an umbrella and process strategies [23], whose development was in part influenced by random events, such as the contacts with Osaka Engineering personnel. It can also be viewed as revealed strategy whose meaning was conveyed to organisational members by means of a myth, rather than as espoused strategy promulgated by the formal communication mechanisms.

Kaizen as a cost reduction strategy

How kaizen was organised

In both plants the kaizen function was headed by a manager who was assisted by supervisors. But the bulk of the operational work was performed by kaizen teams, each comprising two or three operators on long-term secondment from their jobs on the assembly line. A typical secondment might last between nine months and two years. After that time the operator returned to the line. Initial training lasted for one week; one day's off-the-job training followed by four days on a live project concluding with a presentation of results to the project problem. The training began with an introduction to the kaizen principles and forms of waste.

It then moved into a detailed consideration of the kaizen approach and methods. This was systematised and documented into a 20-step process covering the entire process from introduction to project completion. En-route participants were taken through:

● problem diagnosis using techniques such as Pareto analysis, layout diagrams, flow charts;
● recording activities on video, analysing video data on standard work combination charts and process capacity charts to identify waste and non-waste activities;
● identifying causes of waste;
● establishing new targets;
● developing a promotion plan;
● promulgating results.

After one week's training kaizen operators were formed into teams of two or three and set to work.

It can be seen from this account that kaizen

had much in common with traditional work study embracing as it did method study and work measurement. As applied to job design and task specification many of kaizen's concerns are identical to work study: the identification, development and measurement of a standardised method of working.

Kaizen and operational efficiency

Kaizen cut the cost of in-plant operations by nearly £2 million in total between 1992–1996. It did this in many ways, but this section will concentrate on the human resource management aspects of kaizen. The labour input per engine in both plants dropped by 11% and 14% in the Bilchester and Ebworth plants respectively between 1992, the year kaizen started and the second quarter of 1996. Kaizen appeared to have accomplished this by:

● permitting better management control of the effort bargain;
● facilitating a faster, cost effective reaction to the management of work standardisation in both plants.

Kaizen and the effort bargain

Elimination of waste means that management aimed to increase labour utilisation rates both directly, and indirectly where the kaizen problem was targeted on line balancing, inventory control or machine utilisation. Kaizen was intended to increase the proportion of time that employees spent in management defined value-added activities. Therefore for Dieselco's managers a central concern of kaizen was the management and measurement of effort with a view to eliminating slack in the system. It has been argued that such concerns lead to an intensification of the labour process by pushing back the frontiers of control [24]. JIT/TQM systems do this by increasing managers' capacity for surveillance and monitoring; heightening employees' responsibilities and accountabilities; increasing the interchangeability of workers in the production process; peer pressure; and harnessing the mental and manual skills of the shop floor to further the accumulation of capital. Kaizen is seen as supporting this process [25].

The evidence from Dieselco suggests that this is only a partial explanation of how

kaizen intensifies managerial control of the work effort bargain There is another dimension to the phenomenon and that concerns the rules under which the effort bargain is made in a kaizen system. Brown argues that measurement of effort is a bargaining process which occurs within a framework of rules and that these rules can favour either managers or workers [26]. He draws attention to the importance of the rule-making process in influencing the effort bargain, especially the relative importance of formal, written rules as opposed to custom and practice. There was a formal agreement on the use of kaizen between the management of the Ebworth plant and the AEEU signed in 1992, but this was restricted to guarantees that there would be no compulsory redundancies as a result of kaizen and to the selection and training of kaizen teams from the shop floor. There was a verbal agreement to the same effect at Bilchester.

The agreements were silent on the issue of how the kaizen-related effort bargains were to be conducted on the shop floor. It was therefore necessary to observe the rules as they were implemented. Brown wrote about the problem of rule-making and effort bargaining in the context of establishing standard times for use in piecework systems [27]. Dieselco did not use piecework systems; therefore not all of Brown's rules can be applied to Dieselco, and Brown was writing when the labour and product market contexts were entirely different from those prevailing in the 1990s. But two of Brown's rule types do appear to be relevant These were:

- the principal agents involved in the bargain;
- the freedom of work study.

The principal agents involved in the bargain

There are two issues associated with the principal agents in the bargain: the choice of operators whose work is to be studied and who makes the bargain after the study. Brown argues that the greater the choice enjoyed by management in selecting the operators who are to be studied, then the more likely was the outcome to favour management. He notes that where shop stewards are involved in choosing the operators whose work is to be studied, then they would normally choose someone whom they con-

sidered to be adept at confusing management. There was no evidence that Dieselco's shop stewards had any influence in who was chosen to participate in the kaizen studies. Managers had complete freedom to select operators and to reject those whom they considered to be unsuitable.

With respect to who makes the bargain about the new standards and working methods, the issue is of the freedom enjoyed by management to choose with whom the bargain is to be struck. The bargain is more likely to favour management if the bargain is settled with the individual worker whose work has been studied than, say, with a committee of shop stewards chaired by the convenor. What appears to have happened in both plants was that the management settled with the small group of workers most immediately concerned with the work. While individual shop stewards may have been involved in discussions about new work standards, there is no evidence in either plant of disagreements being settled at any point other than at the work group. It can be concluded that kaizen-related effort bargains were more likely to have been made without reference to a wider body of knowledge regarding standards implemented elsewhere in the plant and were thus, on balance, more likely to have favoured management.

The freedom of work study

The accuracy and rigour of the application of work study techniques is a critical factor in whether the resulting work standards will be 'loose' or 'tight' with respect to wasted effort. Brown identified a number of significant dimensions to the freedom managers could potentially enjoy with respect to work study [28]. Three that were relevant to Dieselco were:

- the application of accurate methods of time measurement;
- the number of job cycles managers could observe;
- management demonstrations that proposed working methods are feasible.

A key development in work study in recent years, and one which post-dates Brown's work, has been the introduction of the video. Where this is used, as it was in Dieselco, it has shifted the freedom of work study markedly in management's favour. Making videos of work and processes was an essential part

of Dieselco's kaizen system. The video recordings showed a clock thus permitting very accurate time measurement. The playback facility effectively allowed kaizen teams to observe as many job cycles as they required. The capacity for slow-motion playback allowed work and processes to be analysed to a level of detail undreamed of by earlier generations of work analysts. Many managers commented on the analytical power the video brought to the kaizen process. One continuous improvement manager commented:

> You go out and video it and watch it again and again and record every little detail—even if he walks for two seconds to pick up something. You get right inside the process and you begin to understand it. You begin to realise that what the operator is doing is not necessary. He should not do it So you eliminate it from the process. Even process engineers and industrial engineers do not get into the process in depth the way that kaizen does They don't identify the waste the ways in which we do.

The play-back facility offered managers the opportunity to reflect work back to the operators whose jobs were being studied, thereby increasing the chances that operators would accept and internalise its results:

> And of course there is the clock on the video and you can time all the elements, where he walks to, how long it takes him to pick up a piece and to screw it together—all down in seconds At times we have had operators come up and watch what we have done and sit there with us. You can see their faces change and they say "Why am I doing that?" And they are doing things because they have done them for 10 years and nobody has asked them to do it differently.

An important source of legitimacy for proposed new working methods in any organisation is the ability of managers to demonstrate that proposed changes are feasible. This could be a controversial area. Brown notes:

> It appears to be the case however that, even where only the general unions are involved, management demonstrations are normally banned . . [29]

This was not the case at Dieselco. Managers did demonstrate that proposed new methods were possible. The managerial capacity for successful demonstration of new ways of working arising from the kaizen process was eased by the fact that many of the people now managing kaizen had until recently been employed as operators on the shopfloor. A supervisor in a kaizen team described one example:

> There was then an argument about how long it took to change the tips on the cutters. The operators insisted that it took 90 minutes. So again we did a study. One of my colleagues actually videoed me doing a tip change I did not rush—I just took my time and it took eleven minutes .
> But all along the way we had to prove everything. We had to do it ourselves and to prove it Get it on video, show it to the operators and to management to prove this is how it runs. And this was accepted . . You need somebody in the [kaizen] team who can do the job that is being studied. We had a machinist on the block-line, I was a machinist from the machine shop and we had a chap from assembly, so between us we could pretty well cover any skill in the factory That helped us a lot because we could prove what was said

This incident raises the issue of a kaizen process manned by shop-floor personnel legitimising new work standards to a higher level than could be attained by managerial demonstrations of feasibility. If new working methods and times are legitimised by managers demonstrating their practicability, then how much greater is the imprimatur of validity when it is stamped by members of the workforce themselves?

The data from Dieselco suggest that the dimensions identified by Brown for describing the freedom of work study were too narrow. A theme in the kaizen myth endorsed by many of the people interviewed for this study who worked on the kaizen teams was that the paper-based methods used in kaizen for recording and analysing data, such as standard work combination charts and process by capacity charts were simple to use and brought great clarity of understanding and increased rigour of analysis to the process of managing effort. Certainly to the outsider the documentation employed in the kaizen system at Dieselco seemed much simpler than the esoteric and arcane analytical tools and techniques employed by professionally trained industrial engineers.

Thus it seems reasonable to conclude that one of the means by which kaizen contributed to an improving cost position and decreasing labour input was by effective management of the process of effort bargaining. Under kaizen managers enjoyed sufficient freedom in the choice of both who was involved in the kaizen study process and in the range and use of techniques to ensure that, on the whole, the effort bargains

resulting from kaizen were consistent with managerial objectives.

The management of work standardisation

The second way in which kaizen contributed to reduced costs and decreasing labour input per engine lay in how it resourced the process of work improvement and standardisation that lay at the heart of the kaizen effort.

From the foregoing description it is clear that what kaizen represented was task simplification applied to the work standardisation process itself. Kaizen was Taylorised work planning. The process of work standardisation at Dieselco, as elsewhere in manufacturing, had previously been the preserve of professionally trained industrial engineers. Kaizen represented a means by which virtually anyone could be trained in a week to do an important part of their job. Conti and Warner use Hill's work content model to argue that kaizen involves workers in the planning phase of work as well as the doing of work [30]. This is an accurate, but partial description. The simplified nature of the kaizen training, procedures, technology and analytical systems made possible the shift of professional industrial engineering work from a small team of appropriately qualified managers and technicians to a comparatively de-skilled workforce. Kaizen defined both the outcome and the process of work standardisation in Dieselco.

There was a view in Dieselco that the work of kaizen teams was technically at least as good as that of the industrial engineers; and that given the burgeoning workload driven by the need to increase the volume of output in a production system in a state of continual flux, then there was little alternative but to use kaizen. The position was succinctly expressed by one manager closely involved with kaizen:

> We have 16 people full-time on kaizen· we have trained a further 60 or 70 on kaizen They all have the tools to go out and make improvements. We only have about four industrial engineers in the plant An industrial engineer probably could do it better, but the guy on the shop floor uses the video better—I know I do If an industrial engineer gets stuck on a work station with a watch, then it is very difficult, especially if he is not that familiar with the work station, and if he is not fully trained And industrial engineers are supposed to go away and get trained on effort rating every year to remain qualified

This is not to argue that kaizen meant that an industrial engineer's job was done by lower-priced labour. It was not. In the Ebworth plant shop floor operators who were transferred to kaizen work were guaranteed their shift and overtime premiums and as a consequence earned more than the industrial engineers. The large pool of operators ensured a flexible supply of people who could do technical work to an acceptable standard at short notice.

Kaizen as strategic implementation

Two themes surfaced in the previous section. One was of industrial engineering work being performed by trained shop floor operators. In Mintzberg's terms this represents the transfer of the work standardisation process from the technostructure to the operating core [31]. Therefore there was an issue of structural adaptation. The second theme was of shop floor personnel both as its means, by their role in resourcing the kaizen function; and as its object, as a resource to be used less wastefully This raises the question of their perception of kaizen.

The decision to use kaizen staffed with shop floor personnel did raise issues of territory, and these appeared to be more acute in the Ebworth plant than in Bilchester. The industrial engineers at the Ebworth reported concern that operators were doing an industrial engineering job without the professional training. Further, because operators were transferred with guaranteed shift and overtime pay, they were paid more than professionally trained industrial engineers employed on staff conditions. Klein notes that continuous improvement can mean that first line supervisors become industrial engineers, but the experiences of Dieselco suggest that this conclusion is too narrow [32]. In Dieselco shop floor operators became industrial engineers thus ensuring that disputes about the locus and responsibility for the work standardisation process were as much concerned with its hierarchical location as with its functional status. This further underlines the point that techniques such as kaizen and JIT cannot be regarded as technical fixes which are organisationally neutral [33].

In redesigning jobs and shifting responsibilities Kaizen redistributed power between functions. Oliver states that this can create

tensions between managers and workers, for which he rightly notes that there are no easy answers or off-the-peg solutions [34]. But the evidence from Dieselco suggests that it is not simply an issue of conflict between management and shop floor workers; neither is it a problem of fostering within the management groups a culture of delegation which facilitates an empowered workforce working in a project-focused, team-based organisation [35] The organisational issues in Dieselco arose from the relocation of some work standardisation tasks from industrial engineering to production management, from staff to line, from office to shopfloor. Kaizen displaced technical work in both the horizontal and vertical dimensions of the organisation. Some of the issues which aroused the deepest controversy were bread-and-butter ones of inverted pay and skill differentials rather than culture, empowerment or management style.

There is a view represented by Parker and Slaughter which argues that kaizen is a form of 'management-by-stress' which "places workers on an ever-accelerating treadmill so that they must improve to survive" and an inescapable feature of a regime in which it is "harder for older workers to physically survive in the plant" [36]. Klein argues that the search for a standardised working method means a loss of autonomy for workers both as individuals and as groups; and that the elimination of non-value added time through shortening cycle times and the intensification of multiple-machine working leads to an increase in stress and a worsening major accident record [37].

On the other hand there is a view represented by Adler that the features of Taylorism which were negative for the workforce derive from its externally imposed character [38]. Adler argues that continuous improvement can be an essential part of a strategy of devolving the job of standardising work processes from experts to the workforce and which, if managed correctly, can offer the opportunity to ensure that the "production system is designed to realise as much as possible of the latent collaborative potential between the workers and the system" [39]. Adler envisages the process of work standardisation being managed by employees as potentially offering substantial opportunities for increasing the skill content in their jobs in an organisation which although bureaucratic

has as its salient characteristic 'learning, not coercion' [40].

The interviews with shop floor employees revealed support for both views. With regard to the outcomes of kaizen there were some who saw continuous improvement as squeezing slack out of the system to their personal detriment and of imposing work levels on colleagues which they were unable to meet. This is consistent with Parker and Slaughter's perception of kaizen as management-by-stress [41]. Other employees spoke positively about kaizen for two reasons: kaizen training made the job more interesting; while kaizen-improved work processes made work easier. The kaizen training and the work on kaizen projects was viewed as developing employees' skills in work analysis, team-working and presentation; it trained them in new technologies such as the use of the video and charting methods; and it gave them a sense of control over the design of work. These positive and negative views support those who have argued that the labour process in lean production regimes can be contradictory as it can require shop floor workers to work in what by their standards is a non-Taylorist manner in order that the rest of their work is even more Taylor-like [42]. One view is that the effect of kaizen may be to make work smarter rather than harder [43]. The evidence present here is that, for some employees at least, kaizen made work smarter *and* harder.

There was an additional dimension to the shop floor's perception of kaizen. Many employees saw kaizen as a valuable means by which the job could be made easier. Examples were given of processes where waste elimination had meant jobs which were better designed ergonomically; that is, demanding less bending, carrying and easier body posture. One explanation for this is that despite the large investments in automation and mechanised handling much work of a heavy physical nature remained in both factories.

The fitting of a crankshaft in a diesel engine provided a good example. Crankshafts had to be accurately aligned in the engine case in order that cams and gears could be fitted. This task, known as 'barring an engine', was performed by manually forcing the crankshaft into the correct position using a lever. It could not have been mechanised. One manager commented:

Barring a 50-litre engine is quite something It involves the guy hanging on lever and pulling like hell. You do that fifteen times a shift on a hot day and you know that you've done a day's work

In both plants the shop floor workforce was relatively mature. Details of the age distribution are given in Table 1. Given this age profile and the prevalence of heavy work in both plants, if 'waste elimination' meant work which was less physically demanding, then for many elderly workers kaizen could mean the management *of* stress rather than management *by* stress.

Table 1. *The distribution of shop floor personnel by age: Bilchester and Ebworth plants: July 1996*

	Lower quartile	Median	Upper quartile
Bilchester	38	48	54
Ebworth	38	48	58

Source: Company Personnel Records

The perceptions of workers who had been trained in kaizen and worked in the kaizen teams were, on the whole, favourable Some had reservations about becoming involved with kaizen, but these seem to have disappeared once they were in the process. They valued the skills and training they acquired. For some the opportunity to work on kaizen had been the first step on a career ladder leading to managerial and supervisory posts.

As yet it is difficult to draw any firm conclusions. The data are not yet fully analysed and the case study relies mainly on qualitative data. It indicates only that these perceptions exist: it says nothing about the extent to which these different views were held. But on the basis of the evidence to hand it seems reasonable to conclude tentatively that experiences of the kaizen training and membership of kaizen teams were seen positively; but that experiences of the outcomes of the kaizen process were mixed and may well depend upon contextual factors such as age and technology

Conclusions

This article is about kaizen, but some of its principal lessons seem relevant to other techniques of lean production such as total quality management, statistical process control and JIT production, and to management strategies such as business process re-engineer-

ing. The first conclusion is that managers should be wary of an over-reliance on the techniques of formal strategic formulation and planning. The process by which kaizen emerged and, most importantly, was understood by Dieselco's workforce and its management was messy, accidental and serendipitous. Effective strategy development means that managers should try to build on these experiences and incorporate them. An over-rational approach can drive them out.

A second conclusion is that whatever kaizen may mean for the workforce, it helped achieve management's objectives. It saved Dieselco £2 million in three-and-a-half years and it created a reservoir of labour skilled at analysing and standardising work processes. The interplay between the competitive conditions in the diesel engine industry, Dieselco's competitive strategies, and the economics of diesel engine production meant that kaizen workers would be fully employed in the foreseeable future. To this extent it is a source of competitive advantage: it is a means of levering resources [44]. The technique may be portable, but its outcome is a workforce with deep knowledge of the production processes But whether kaizen has potential as a source of sustainable competitive advantage is open to question [45]. The evidence from this case suggests that it can be easily imitated and therefore it cannot offer adopting firms a lasting source of superior performance. This in turn raises the questions of where firms should look for sources of sustainable superior performance should all organisations in the competitive industry adopt kaizen. What happens when all firms reach world class manufacturing standards?

Kaizen cannot be seen as organisationally neutral. It redistributes power between management and the workforce; line and staff managers; and within the management group. One of the reasons why it works is that it offers management much tighter control of the effort bargain, but it achieves this in part by recasting the rules regulating the settlement of the effort reward bargain. Concomitant with its effects on the distribution of power are consequences for the earnings, job status and future career progressions for employees both as individuals and as groups. These factors seem to be much greater impediments to its implementation than the softer obstacles such as 'culture' or 'empowerment'.

Finally, the evidence on workers' percep-

tions of kaizen suggests that shop floor experiences of kaizen may be contradictory, with the kaizen process being seen in a favourable light; but some outcomes are viewed unfavourably. Perhaps 'effort' may be better conceived as a multi-dimensional concept embracing weight, speed, movement, posture. Kaizen may manage each of these dimensions in different ways some of which may be regarded as positive, others as negative. The evidence suggests that to the extent that it removes hard, physical work then kaizen may have an appeal to an ageing workforce. This not only argues for a contextual view of kaizen, but given the widespread perception that the British workforce is ageing, then its attractiveness for manual workers might well spread.

Acknowledgement

The author wishes to acknowledge the helpful comments of an anonymous referee. The responsibility for any remaining errors, exceptions and omissions remains with the author.

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Appendix 3

Continuous improvement capability: assessment within one case study organisation

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Abstract *Continuous improvement (CI) programmes have been recognised as one way of contributing to the productivity and efficiency within the manufacturing setting. However, the development of a sustainable CI programme has proved more problematic and in some cases fails to proceed any further than one-off improvement activities. The research presented here illustrates the utility of Bessant and Caffyn's framework for the development of CI capability, by assessing the structure of CI within one case study organisation. The structure of the CI programme and examples of CI activities provide evidence of the link to top down strategic business targets. The discussion suggests that the organisation has moved to a "goal oriented CI" where there is formal deployment of strategic goals through the structure of the CI activities and the relationship with business activities. Practical and theoretical implications of using this framework are considered.*

The contribution of continuous improvement to the manufacturing context

The involvement and participation of the employees in new production arrangements has been identified as a key aspect in the use of new methods of manufacturing such as just-in-time production (Oliver and Wilkinson, 1992). In production systems such as Toyota's, this has been successfully carried out through kaizen or continuous improvement (CI) activities.

The process of continuous improvement, or kaizen, was pioneered in manufacturing companies in Japan, primarily in response to (or alongside) the introduction of the just-in-time (JIT) production system, which facilitates a constant reduction in waste. Continuous improvement within a JIT environment has also been hailed as one of the cornerstones of Japanese manufacturing success (Imai, 1996). However, this is not necessarily a Japanese innovation; the process of actively encouraging employees to participate in the continuing incremental improvement of products and processes can be reportedly traced back at least to the Industrial Revolution (Schroeder and Robinson, 1991). Even so, although isolated pockets of CI can be found in post-war Western manufacturing, it is clear that the majority (and most successful) application of this concept has, until recently, been in Japan. This is perhaps due to the pressure to conserve and use resources efficiently, in a country with relatively few natural resources.

Use of CI programmes – evidence and research

Evidence of the use of CI in the UK show that in 1991 72 per cent of their sample (*N*=66) reported using continuous improvement (CI), with a further 20 per cent planning to introduce it (Oliver and Wilkinson, 1992). As Oliver and Wilkinson (1992) note, this is a surprisingly high proportion claiming to have programmes, but there are no details of the extent and breadth of the reported CI programmes (p. 139). Other surveys carried out by the present author show similar reported usage. For example, in a survey of 60 manufacturing companies in one region of the UK, 83 per cent reported using or planning to implement CI (Winfield and Kerrin, 1996).

In terms of specific CI activities such as the suggestion scheme, recent research presents a striking contrast in a comparison of UK and Japanese manufacturing companies (Oliver *et al.*, 1998). All the Japanese plants in the study had a suggestion scheme, compared to two-thirds of the UK plants, but more importantly the rate of suggestions differed. In Japan, there were on average 30 suggestions per head, per annum, compared to two suggestions per head in the UK. Both countries had similar amounts of problem solving groups, such as quality circles (QCs), but the proportion of employees involved in these groups was higher in Japan (more than 80 per cent) compared to the UK (less than 50 per cent). Similar figures from Japanese companies are reported by Schroeder and Robinson (1993), who outline the top ten kaizen or CI programmes in Japan in 1990, with the top company returning 426 ideas per worker.

Since 1994, European wide surveys have been carried out by participants in the EuroCINet project, including reports from Ireland, The Netherlands, and Sweden (Coughlan *et al.*, 1997; Gieskes *et al.*, 1997; Lindberg and Berger, 1997). Some survey data on CI have also been gathered from Australian organisations (Chapman *et al.*, 1997). These surveys aimed to obtain information on the diffusion of CI and the way that CI was being put into practice across the countries involved.

In the UK, the focus for CI initiatives in the early 1980s was centred around quality circle (QC) activity and participation. Despite its importance over the long-term, CI has been relatively under-researched and there are still gaps in our knowledge about the process and the successful management of it. As Bessant *et al.* (1994) and others before (Kanter, 1984) highlight, there are some general prescriptions for creating a suitable environment and establishing an innovative culture, but there is, as yet, little systematic research on the specific requirements for continuous improvement, or on how these might vary according to different organisational circumstances.

Examining CI – the research problem

Among the major contributors to the research into CI have been Bessant *et al.* (1994; 1995) and Bessant and Caffyn (1997), who base their research in the context of the innovation literature. CI is perceived as a routine which extends the involvement in the innovation process across a larger proportion of the organisation than is usually the case (Bessant *et al.*, 1994, 1995). Their research

is aimed at improving the understanding of the process and how it can be successfully managed through enabling and sustaining routines.

To support this type of learning for routines, Bessant *et al.* (1994) recognise the need for a CI framework for capability development. This reflects what they identify as the key characteristics of a successful organisation's implementation and maintenance of CI programmes. There is an emphasis on the interconnections and they outline ways to develop the routines and behaviours necessary for a successful CI process (Bessant *et al.*, 1995). Drawing on the innovation, organisational change and organisational learning literature, Bessant *et al.*'s model highlight characteristics that an organisation needs in order to develop CI capability. In their more recent work, Bessant and Caffyn (1997) elaborate on their earlier model and put forward five stages of development in the evolution of CI capability which can be seen in Table I.

To develop through these stages, the authors suggest that it is dependent on absorbing a number of behavioural routines (see Table II). These are arranged around a series of themes, moving from acquiring the CI habit to developing a full-scale learning organisation. Bessant and Caffyn (1997) suggest that each of the themes would have a number of constituent behaviours; for example, the organisational ability for "Getting the CI habit" might include "people use

Stages of development	Typical characteristics
1. Natural/background CI	Problem solving random
	No formal efforts or structure
	Occasional bursts punctuated by inactivity and non-participation
	Dominant mode of problem solving is by specialists
	Short term benefits
	No strategic impact
2. Structured CI	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
3. Goal oriented CI	All of the above plus formal deployment of strategic goals
	Monitoring and measurement of CI against these goals
	In-line system
4. Proactive/empowered CI	All of the above plus responsibility from mechanisms, timings etc., devolved to problem solving units
	High level of experimentation
5. Full CI capability – the learning organization	CI as the dominant way of life
	Automatic capture and sharing of learning
	Everyone actively involved in innovation process
	Incremental and radical innovation

Table I.
Stages in evolution of CI capability

Source: Bessant and Caffyn (1997)

Organizational ability		Continuous improvement capability
Getting the CI habit	Developing the ability to generate and sustain involvement in CI	
Focusing CI	Generating and sustaining the ability to link CI activities to, the strategic goals of the company	
Spreading the word	Generating the ability to move CI activity across organizational boundaries	**1157**
Continuous improvement of continuous improvement	Generating 'the ability to strategically manage the development of CI	
Walking the talk	Generating the ability to articulate and demonstrate CI activity	
The learning organization	Generating the ability to learn through CI activity	**Table II.** Organizational routines for successful CI

Source: Bessant and Caffyn (1997)

appropriate simple tools and techniques to support CI", and "ideas are responded to in a clearly defined and timely fashion". For "Focusing CI", behavioural routines might include "individuals and groups use the organisation's strategic goals and objectives to focus and prioritise improvements".

The research presented here has responded to Bessant et al's. (1994) suggestion of the need for further knowledge and understanding of the CI process, by examining one case study organisation and their CI activities. The evidence of CI activity presented will be assessed against the stages of development put forward by Bessant and Caffyn (1997), to establish at what stage the company are in terms of capability development. This analysis is of theoretical and practical importance: theoretically, to assess the framework as an explanation for CI capability; and as a practical tool which organisations can use to guide development.

Methodology – the case study organisation

One benefit of using a case study strategy in investigating CI, is being able to track the process and the improvement ideas. Examining who, what or why problems are solved and following the development of current improvement activities is facilitated by a researcher spending a substantial amount of time inside the company.

In selecting the case study, a number of approaches were taken. First, the UK suppliers from a local car manufacturer were surveyed on particular management and manufacturing practices, including CI. Of 60 companies, 12 companies returned the questionnaire and each of the 12 were interviewed. Initially, these interviews provided an exploration of the issues and an opportunity to see if the organisation was suitable and would be receptive to a more detailed project. This strategy has been termed "casing the joint", after which the researcher formally approaches with a research proposal (Schatzman and Straus, 1973). One company was selected as it provided an opportunity and the appropriate context to explore the research question. The organisation,

previously British owned, had recently been taken over by a Japanese company. These factors contributed to the potential richness of the data which could be gained through using such a case study.

The company manufactured radiators and cooling systems for car and truck manufacturers world-wide and since the Japanese parent company had invested in the organisation in 1988, changes were gradually taking place, such as the introduction of just-in-time (JIT) manufacturing, statistical process control (SPC), cellular manufacturing and a CI programme. The case company, at the time of the research, had 840 employees at two different sites, approximately 25 miles apart. The largest and main site had 700 employees and had been expanded since the take-over in 1988.

Data collection
The research, which was carried out over a ten-month period, focused on a number of production lines within the factory. Early on in the research process, the researcher walked around the organisation following the workflow and observing the work undertaken. This helped to map out the principal sources of data relating to CI activities and as Hartley (1994) suggests, it provided an idea of the best and worst times to talk to people, on both a daily basis (e.g. breaks) and seasonal (e.g. holidays).

Within the case study strategy, a number of methods, or sources of evidences are available (Burawoy, 1979; Hartley *et al.*, 1983; King, 1994; Forster, 1994). Table III identifies the methods used in this research.

Manufacturing process and factory layout
To provide a context to the CI activities, some of the important features of the factory layout and manufacturing process must be outlined. The research was

Method	Example
Direct observation	Weekly basis – attended management production meetings Factory floor – frequently walking through the factory, observing processes and activities Base desk – Located in the production control room
Interviews	Unstructured and semi-structured – Different levels of the organization; 30 employees including 3 cell managers, 7 section leaders (1 from nights), 1 cell engineer, 6 team leaders and 8 operators, Manufacturing Director, HR Director, Training and Development manager, the Quality assurance manager, the Improvement Officer and Production Control manager Pre and post workshop interviews with employees Informal discussions
Documentation	Information relating to CI activities e.g. suggestion scheme records, company newsletters
Participant observation	CI workshops on site

Table III.
Methods used within the case study

carried out in the old part of the larger factory. The researcher was allowed access to all areas, but because of the limitations of one researcher in a large organisation, the focus of the research was confined to one area. Some contact was made with the newer factory area, but it was limited. The product layout of the old factory was based around four main product lines. Out of these four, the research into the CI process was carried out in three, Line 1, Line 2 and Line 3, as the fourth line had only recently been introduced. There were some common processes which all the product lines used, such as the paint process and the degreaser process, but most of the products had their own machinery and tools. The basic process of the production is outlined in the list below, (although there were variations on this depending on the specifications of the product):

(1) Book materials.
(2) Stores.
(3) Stock transfer.
(4) Start process.
(5) Degrease parts.
(6) Run airway.
(7) Core build.
(8) Tie bar.
(9) Degrease core.
(10) Slam core.
(11) Tog 0-Loc.
(12) Load carrier.
(13) Braze.
(14) Unload and view.
(15) Vac test.
(16) Stand 12 hours.
(17) Inspect units.
(18) Crimp.
(19) Dry test.
(20) Assemble.
(21) 1 in 12 SPC check.
(22) Test fan cowl.
(23) Vac test.
(24) Pack.
(25) Inspect.
(26) Dispatch.

Development of the CI programme
It was within the changing context described above that continuous improvement (CI) was introduced to the organisation. The first pilot of CI in the case company was at the smaller site, and was introduced jointly by the existing British MD and a Japanese colleague.

Although the pilot had been successful, by 1991 it was still very much a management led continuous improvement initiative and this was felt to be the reason behind some of the setbacks experienced at that time. However, this pilot programme provided the starting point for CI within the organisation, in particular in introducing the reporting mechanisms to senior management. The next section will examine the development of these structures and the situation at the time of the research.
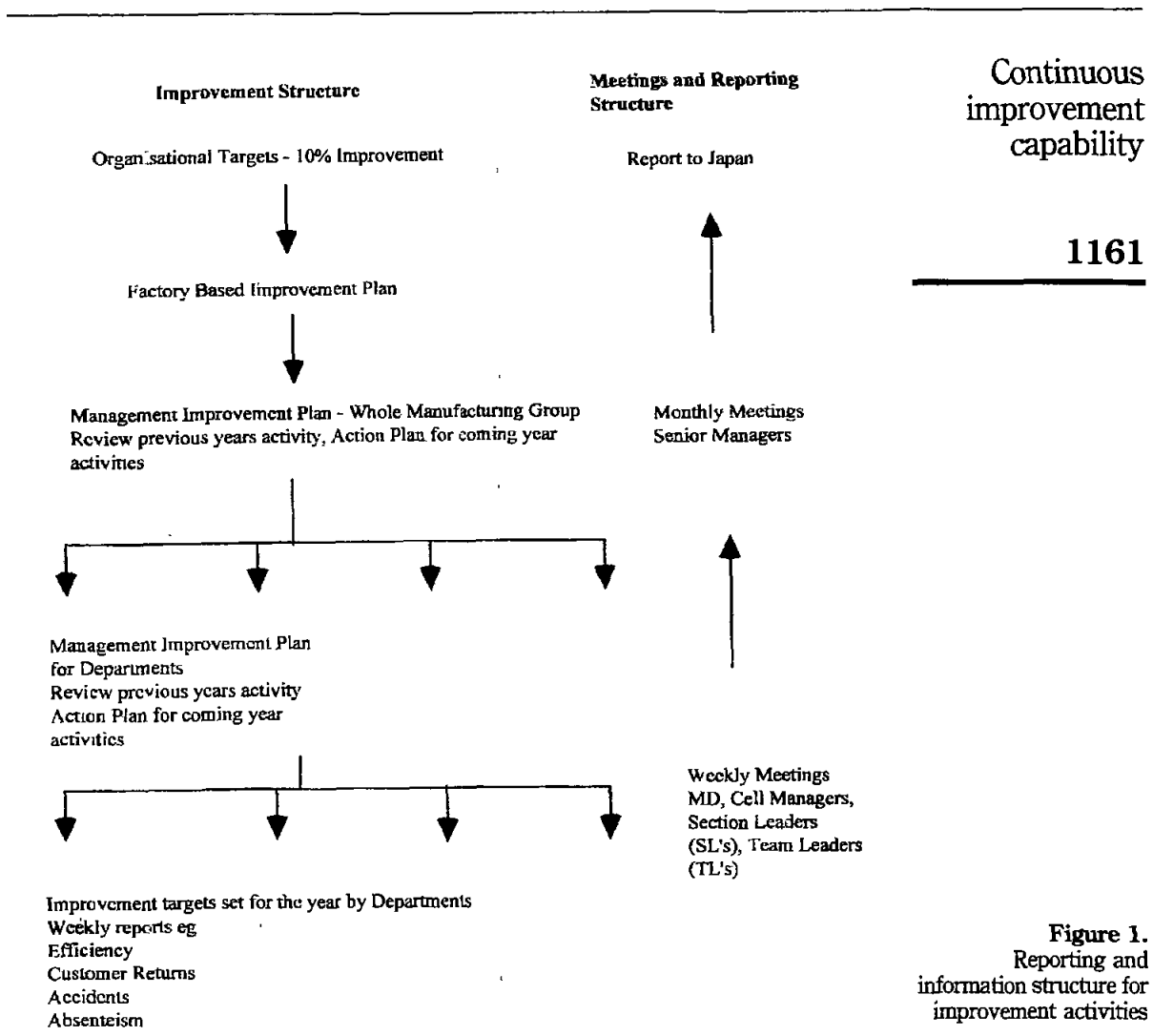
Structure of CI activities and the relationship to business objectives
After the pilot programme at the smaller site began to produce results, the CI programme was introduced into the main site. The CI programme was developed directly from the business plan of the organisation. For example, the productivity improvement plan was set each year for the factory and from this improvement targets for one year were generated for each department. These aimed to be "achievable and believable" and the targets were reviewed after six months.

An example of this structure is illustrated in Figure 1, where a clear reporting and information structure is described. The organisational improvement targets referred to at the top of Figure 1 are drawn from the targeted 10 per cent improvements that the manufacturing director set for the year. These included a 10 per cent improvement in material supply; managing style; participation; CI (kaizen) and total integrated engineering (TIE) workshops; training; technical support; quality; performance; attendance; machine efficiency; and material flow.

As can be seen in Figure 1, once the annual target is set, it is broken down to a Factory Based Improvement Plan which, among other things, sets the aims, method and organisational impact of the improvement plan. The Factory Based Improvement Plan is then translated to a Management Improvement Plan for the whole manufacturing group, which outlines the role of the department, a review of the previous year's activities and provides a focus for the upcoming year's improvement activities, along with an action plan. This is then translated to a Management Improvement Plan for specific areas of the manufacturing group, which outlines the basic policy, long term plans, review of the previous year and where a main action plan is presented for the coming year alongside a method for managing it. From this main action plan, goals and objectives are identified, including summary sheets.

Using this information, individual departments and sections can identify improvements that are required for the year. At the beginning of the year, each section sets a number of improvement targets which are specific to their section and also relate to the organisational improvement targets. These provide the basic improvement targets for the section.

Improvement Structure

Meetings and Reporting Structure

Continuous improvement capability

1161

Organisational Targets - 10% Improvement

Report to Japan

↓

Factory Based Improvement Plan

↓

Management Improvement Plan - Whole Manufacturing Group Review previous years activity, Action Plan for coming year activities

Monthly Meetings Senior Managers

↑

Management Improvement Plan for Departments
Review previous years activity
Action Plan for coming year activities

Weekly Meetings
MD, Cell Managers,
Section Leaders
(SL's), Team Leaders
(TL's)

Improvement targets set for the year by Departments
Weekly reports eg
Efficiency
Customer Returns
Accidents
Absenteism

Figure 1.
Reporting and information structure for improvement activities

As the weeks progressed and problems and improvements occurred, they were documented by the team leader (TL) or section leader (SL) and then reported by them or the cell manager to weekly production meetings (see Figure 1). For example, most areas will provide an update on efficiency, what problems affected it this week, how these will be resolved and the individuals responsible for carrying this out. Customer returns, number of accidents that week and a record of absences were also documented.

The information from weekly management meetings is taken as a monthly report to senior management board, where the MD uses an improvement summary report for the month and at a glance, the areas of improvement can be seen, as can the areas where the targets have not been met. In addition the

reasons why the targets have not been reached on the shop floor are noted. These reports are then communicated back to the parent company for analysis on a monthly basis.

Overall, this system illustrates the structured approach to CI through the use of manufacturing improvement teams and the allocation of tasks in relation to the strategic targets to be achieved. Specific examples of how these CI activities on the shop floor feed in to these targets will now be given. This will provide a clearer picture of how the targets are achieved in daily activities with operators and teams.

CI activities – integration with production targets

As outlined, weekly production and efficiency targets were drawn from the yearly targets, setting the standard for continuous improvement within each section. QCs, improvement workshops and suggestions schemes were designed to aid this improvement process. The examples from the CI activities such as QCs and the suggestion scheme will demonstrate the contribution to achieving the yearly production targets. This, together with the information previously presented regarding the development of CI, will be used to assess the organisation's CI capability in relation to Bessant and Caffyn's (1997) model.

Quality circles – Line 3

Quality circles (QCs) formed the basis of problem solving within several sections. In one section, Line 3, a high internal leak rate on one product had been persistently reported to weekly management meetings and the problem provided the focus for a QC. As part of the "Line 3 variable reduction team", a separate testing measurement was set up to track the leaks. This utilised a large-scale diagram of the product where all the areas of leaks and problems that occurred on that product were charted. This was carried out by the operators and managers in addition to their normal work. A grid was produced underneath the diagram of the product and displayed the week number, the total number of products made, the total number of defects and a comprehensive breakdown of the areas of defect. This gave the QC members an accurate picture of where, for example, leaks were commonly occurring over a given time period. The problems were identified through weekly reviews of productivity and leak rates, both within the section and at management meetings. The QC approached different problems outlined by the grid and provided a structure to systematically analyse the problems over a longer time period. Line 3 had three QCs that were set up and running over a number of months relating to this area, one of which is explained in more detail here.

"GB" QC

The "GB" QC was made up of employees from the Line 3 section and some external specialists. The participants included the section leader (SL), three team leaders (TLs) and two operators. Two engineers and a quality assurance manager who were responsible for that section and had built up specialist knowledge of that product, were also involved. The mapping technique,

outlined above, identified that there was a high leak rate in the area where the units were brazed. Using brainstorming and Pareto-analysis tools, the QC detected a number of factors which were contributing to the high leak rate on the Line 3 brazed units. These included:

(1) Some smaller diameter braze rod still being used.

(2) Units not being re-steamed after repairs.

(3) Various testing personnel being used.

The counter measures that the QC came up with included:

(1) Change core-braze rod from 1.5mm to 2.4mm.

(2) Change flow characteristics of rod for ease in making sound joint.

(3) Change repair process to steam-test-steam.

(4) Set team members to test and steam.

Each of these measures was implemented and evaluated by members of the QC, the operators and the quality assurance manager. The second counter measure eventually led to a design change. Previously, operators punched a hole in the copper and made a bevelled end through which the next process would insert another piece of copper and braze around it. It was thought that they needed this bevelled end for extra strength when the next part was brazed into the hole. However, the analysis of the SPC chart highlighted that this was one of the main areas for leakage. Examination of the problem showed that the surface area of the bevelled end made it more difficult to braze effectively. The problem was analysed further and performance tests were carried out. Using problem solving tools, they established that there was no real need for the bevel as the part was just as strong without it. They were then able to braze the two parts together without the bevel by changing the flow characteristics of the rod to achieve a sound joint. At the same time, they changed the specifications of the process from 1.5mm to 2.4mm. The combination of this and a change to the repair testing process led to a reduction on the leak rate on first time braze from 20 per cent to 6 per cent, a cost saving of £3,000 in one year.

Suggestion scheme
The suggestion scheme at the company provided a forum for individual and group suggestions and ideas. This existed alongside the formal structure of the quality circles (QCs) and improvement workshops. The participation in the suggestion scheme varied throughout the factory and while the research was being carried out, the scheme was in the process of being reviewed. The figures available from one of the sections under study provide an indication of the rate of suggestions per person, per year. In 1992-1993 there were 127 ideas from 256 people, 0.50 ideas per person in the year. The acceptance rate of these ideas was 60 per cent with an average payout of £137.22. In 1993-1994 there were 87 ideas from 228 people, 0.38 ideas per person. The acceptance rate of these ideas was 76 per cent with an average payout of £579.65.

The scheme rewarded individuals with 50 per cent of the first year savings of any idea that was accepted. There were a number of stages that operated before the company accepted the idea and presented the reward. First, each idea had to be proposed to the team leader and gain his or her support before going to the suggestions committee. The person or group putting in the suggestions would have to provide some explanation of the improvement and where the cost savings or improvement would be. The suggestions committee would then investigate the idea to see if it was viable, whether they would implement it, and evaluate what the real savings would be if it was introduced. Based on this analysis, the proposer would be given 50 per cent of the first year savings. The TL would also gain a percentage of the savings, or often there were informal payments from the operators to their team members. This process is best illustrated by providing some examples of ideas that were put forward and how they contributed to solving production problems.

Packaging and recycling ideas
Suggestions related to changes in packaging had become a popular way of receiving rewards from the scheme. One such idea was put forward by an operator which involved packing the product using plastic separators rather than hardboard separators. The investigations by the manager concluded that the plastic separators were just as efficient and were passed by the inspection. The calculations demonstrated that the hardboard separators cost £1.71 and the plastic separators cost £1.08 with a saving of £0.63p. The saving made of the number of units shipped per week for weeks 3 to 15 were calculated with a total saving of £1,703.52. Fifty per cent of this saving then went to the idea proposer, and 10 per cent to the idea implementer (TL).

A further idea put forward relating to packaging was to use a different type of box to export the product. This would be of particular benefit for exports to the USA where a collapsible cheaper box could be transferred back and re-used. This idea originated from exports to a German customer who would only accept the product in recyclable boxes. Differences in environmental policies meant that this customer was able to impose this on the company as a condition of supply. The case study company had to design a way of transporting their product without using cardboard or other disposable material.

Another example of a suggestion was to recycle plastic caps rather than throwing them away. The caps were used to cover the holes in the radiator so that they were protected from the paint when the product went through the paint booth. After the caps had been through the paint booth, they used to be thrown away, as they were covered in paint. New ones were put on each time. The suggestion was for the operators to clean the paint off the caps after they came out of the paint booth, so that they could be used again. The savings made were based on the cost of a cap at 5p to replace each time they were thrown away.

All of these packaging and recycling ideas contributed to the improvement targets in the appropriate sections, either by saving money, reducing waste and

storage space or improving the overall quality of customer deliveries. Other suggestions which were put forward and implemented varied from improvements to machine utilisation and operator efficiency.

Analysis and discussion

Further examples could have been presented from other CI activities such as the improvement workshops internal to the organisation and problem solving groups with customers and suppliers, each demonstrating the contribution to planned targets. However, the data documented so far provide evidence of the CI structure and impact within the case study. One aim of this paper is to assess the case study against Bessant and Caffyn's (1997) framework and description of the development process. As outlined in Table I, Bessant and Caffyn put forward five stages of development in the evolution of CI capability and the evidence presented in this paper would suggest that the current case study is currently at Stage 3, "Goal Oriented CI". This is due to the formal attempts to create and sustain CI using problem solving processes within QCs, suggestion schemes and improvement workshops. Training in basic CI tools is offered and a financial recognition system is in place for the suggestion scheme, and a non-financial system for the QCs. The evidence suggests that the organisation has moved to a "goal oriented CI" where there formal deployment of strategic goals through the structure of the CI activities and the relationship with business activities as illustrated in Figure 1. In the case study, the CI activities are monitored and measured against these goals at the weekly management meetings, and feedback given each week on how well the various departments are doing against their set improvement goals. Stage 4 has yet to be reached as, although there was some evidence of devolving responsibility to problem solving units, there was little evidence of high levels of experimentation.

To develop to this stage where formal deployment of strategic goals has occurred, Bessant and Caffyn suggest that it is dependent on absorbing a number of behavioural routines (see Table II). Out of the six behavioural routine themes that are put forward, two can be assessed in relation to strategic issues.

The first is where Bessant and Caffyn outline "Focusing CI – generating and sustaining the ability to link CI activities to the strategic goals of the company". This has been clearly outlined through the yearly improvement targets which are set by the Manufacturing Director (MD) in conjunction with the broader goals of the company discussed at board meetings. These targets are cascaded down to each section and the evidence presented suggests that individuals and groups, through weekly management meetings, do use the strategic goals of the organisation to focus and prioritise improvements as suggested by Bessant and Caffyn. Section leaders and team leaders appeared to understand the company goals as the achievement of the set targets. The assessment by individuals and groups of their proposed changes on the improvement targets was highlighted in the examples of the QC and the suggestions scheme described above. The enablers that Bessant and Caffyn point to which can

contribute to the development of this behaviour may include "focusing problem solving on strategic targets/policy deployment" such as the structure existing in the case study.

The second behaviour routine which relates to Stage 3, is the "Continuous improvement of continuous improvement – generating the ability to strategically manage the development of CI". Here, the authors suggest the need to continually monitor and develop the CI system where the CI system is regularly reviewed and amended. This was carried out in the case study via the weekly management meetings and the monthly report by the MD to senior management board. This ensured that CI activities were operating within the weekly system and infrastructure. The weekly and monthly management meetings provided the formal steering group and strategic framework which enabled this behaviour to be successful.

Practical considerations from using this framework suggest that this type of analysis can offer organisations guidance on the development to stage 4 through encouraging experimentation. Developing the frequency of suggestions put forward by operators to something nearer to the rate reported by Oliver *et al.* (1998), could increase levels of experimentation of ideas. Implementing structures and behaviours to encourage this appears to be the next step for this case study organisation.

Conclusions

This paper has examined the CI structure and practice within one case study company. It has argued that the organisation has developed to Stage 3 of Bessant and Caffyn's (1997) capability framework. The evidence presented suggests that in relation to the six behaviours put forward by Bessant and Caffyn, the case company would appear to have created structures for a CI system which links strategically to organisational targets. Evidence presented here demonstrates how the CI activities affect the set targets.

The CI structure in the case study generated ideas and participation from employees, but this is within a structure that is linked to yearly improvement targets and business objectives. The model presented in Figure 1 reinforces the need for CI to be strongly linked to business targets as a directed top down process, as well as encouraging bottom up participation of employees. Figure 1 illustrates the top down process which help to achieve the goals and targets set by management at the beginning of the year. In the case study company CI emerged as a planned process, centred around the set improvement targets and linked to organisational objectives, unlike other case studies where the emergence of CI or Kaizen is perceived as a "messy" process (Malloch, 1997).

In conclusion, while CI may initially be perceived as an easy to implement, bottom-up participation mechanism, aimed at encouraging the involvement of all employees in the solving of problems, the evidence presented here illustrates the complex nature of any such programme and its development. The case study evidence presented above suggests that the CI process is not simply a bottom up initiative, as this misinterprets the complexity of the process, and that there are many important strategic links to top down processes and

structures which are important. It is only when these are in place that the impact of CI activities such as QCs and suggestion schemes can be truly evaluated.

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