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Does the Emperor have any clothes?

The diffusion of Japanese Manufacturing Techniques to Enterprises in South Africa

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Abstract:

The objective of this research is to investigate the factors at plant level which impact on the diffusion of Japanese Manufacturing Techniques to enterprises in developing countries generally, and South Africa specifically. This informs the development of meaningful supply-side measures to improve the competitiveness of South African manufacturers. This has been achieved through both a thorough examination of the literature and through field research. The field research documents the implementation experiences in fifteen South African plants which participated in the Shopfloor Best Practice workshops of the Manufacturing Roundtable (MRT). I chose to examine these examples of transfer as I was a participant researcher, attached to the MRT. The central question which guided my research is what are the factors which affect the depth of systemic adoption of Japanese Manufacturing Techniques on the shopfloor in South Africa, and what this indicates for the breadth of diffusion of the techniques across the manufacturing sector as a whole. The research argument is that for sustainable adoption both social and technical aspects of Japanese Manufacturing Techniques need to be addressed. Focusing on the technical aspects only and presenting a universally applicable model obscures the realities of transfer, as the embeddedness of the techniques in the social and institutional context is ignored.

The point of departure for analysis in this thesis is thus real examples of transfer, as opposed to a universally defined and abstracted model. The experience and opinions of the workshop participants, and those of managers in their plants, have been gathered through individual in-depth interviews and site visits. The evidence indicates that there are many factors both internal and external to the firm which are likely to constrain significantly the ability of some firms to move in the systemic direction. These include the poor primary education of much of the workforce, poor management skills, wage and social inequality and a lack of participation in the workplace. It becomes apparent that the process of diffusion amongst South African manufacturers is not likely to be rapid or steady, and that the most likely path is one of uneven diffusion.

Introduction:

1. Outline of research objective, ideas and argument:

Enterprises the world over are faced with the choice of implementing Japanese Manufacturing Practices as a way of meeting the competition from Japan, and other East Asian countries. It is argued in much of the literature that firms failing to adopt these techniques will not be able to compete in the increasingly global market. As South African manufacturers are increasingly exposed to global competition after decades of protectionism and international isolation, they too are concerned with improving their manufacturing performance. Many are looking to Japanese Manufacturing Techniques as a strategy for production. This raises questions about the process and pattern of diffusion of these techniques to countries outside of Japan, to the developing world and to South Africa in particular. Understanding the actual process of diffusion is critical as it provides the tools with which to begin examining the choices and strategies for improving productivity at firm level, and informs the development of supply-side support strategies from Government.

1.1 Research objective:

The **research objective** is to investigate the issues at firm level which impact on the process of diffusion of Japanese Manufacturing Techniques to manufacturing enterprises in Developing countries, and to South Africa in particular. The restructuring of the labour process in firms in South Africa is going ahead, and Government sponsored initiatives designed to support workplace change, such as the Workplace Challenge, are in motion. This thesis is thus timeous as a critical examination of the nature of these changes, together with an understanding of what is likely to impact on the process of adoption and diffusion, can assist with the design and development of supply side support programmes at micro-level.

This objective is met by examining empirical examples from the literature, as well as from field research. The field research involves plants which participated in a workshop to train workers in shopfloor techniques originating in Japan, specifically 5S and Visual Management. The issues which arose in the process of post-workshop implementation in these plants are examined. While the sample can not be said to be representative of all South African manufacturing enterprises, I hope to be able to draw pointers to the factors which are most likely to impact on the process of diffusion of

Japanese Manufacturing Techniques in SA. The empirical examples are presented against a background of theoretical discussion around the nature of the Japanese Manufacturing Techniques and the extent to which they represent a new paradigm in production management.

1.2 Ideas guiding the research:

The **central question** guiding this research is what are the factors which impact on the systemic adoption of Japanese Manufacturing Techniques to the shopfloor of manufacturing enterprises in South Africa. The term "systemic" refers to when the different elements of Japanese Manufacturing Techniques are combined in a co-ordinated way as part of an integrated package of measures. It is argued that this is when the greatest competitive advantages are gained[1]. The depth of systemic adoption is likely to provide clues as to the breadth of diffusion.

The **research argument** is that the principles of Japanese Manufacturing Techniques represent a new way of thinking about production, the long term success of which depends on the degree of systemic adoption. This entails viewing the techniques as requiring both social and technical transformations. Further, there are significant factors which impact on the process of systemic adoption and transfer, and that as a result the pattern of diffusion is likely to be uneven, and that the "systemic gap" will remain.

2. Methodology:

A significant portion of the methodology section is devoted to describing the Best Practice Initiative of the Manufacturing Roundtable. This is because the initiative was devised as an action research project to 'learn by doing'. I was a participant researcher in this project and the data collected for this thesis arises out of this process. This thus forms the background to the research described below.

2.1 Background to the research:

This research formed part of a broader project, the Best Practice Initiative (BPI) of the Manufacturing Roundtable (MRT), a research wing of the Graduate School of Business of the University of Cape Town.

[1] A more rigorous definition of systemic adoption is provided on page 17 of Chapter One.

The MRT began as a partnership between academia and industry, and since then the Department of Trade and Industry has also become a member. The aim of the MRT is to promote research into the field of manufacturing and to assist with the competitiveness of manufacturers in South Africa.

The Best Practice Initiative originated out of the concern of the member companies of the MRT to develop an effective, indigenous implementation approach to best operating practice on the factory shopfloor. This is seen as critical to improving the competitiveness of South African manufacturers (Background to the BPI, MRT documentation, 1995).

The BPI was effectively an action research project with the aim of 'learning by doing'. The intention was to train teams in shopfloor best practices and to learn from their implementation experiences.

My role was to organise the training workshops, and to facilitate the smooth running thereof. I was also an assistant researcher on the project. I could thus be considered to be a participant researcher. I left the MRT at the end of March 1997 when I began writing up this dissertation.

Shopfloor best practice training workshop:

Three workshops were held in 1996, in February, May and August. The first two were held in Cape Town and the third in Richards Bay. Each was hosted by a company whose factory floor was used for the training. A detailed examination of the content of the workshop is provided in Chapter Four, where it is best located to inform the findings which arise out of the research.

Seventeen companies participated in the three workshops held in 1996. Participants were drawn from eighteen different plants, two head offices and one management consultancy.

Selection of participating companies:

Invitations to participate in the workshop were extended first to MRT members and thereafter the Manufacturing Roundtable Data base of manufacturing enterprises in SA was used to select companies to be invited to participate. A query was constructed whereby all manufacturing enterprises were selected, and the invitations were sent to people close to production and the shopfloor such as factory or production managers. It was felt that production people would best be able to judge if the workshop was appropriate for their operations. Also, the researchers hoped to learn from the implementation experiences following the workshop, and since it would most likely be

production management who would be involved in the implementation, it was decided that they would be the best to approach. The sample was thus self-selected.

There were no requirements for the acceptance of companies into the workshops. In Table 1 below it is evident that the plants which participated represent a broad spectrum of manufacturing techniques, ranging from traditional mass producers (who were using the workshop to investigate possible routes to becoming World Class Manufacturers), to plants which had been implementing improvement programmes for a number of years. It is evident from the table that eight of the participating companies were in the first year of implementing World Class Manufacturing (WCM) initiatives or improvement programs. Two companies were in the 2nd year, and only one in the fourth year. Three of the companies had no determined improvement drives at the time of the interviews. All the participating plants are brownfield sites[2]. One had a new manufacturing facility following a fire (after they hosted the first workshop), but the workforce remained the same. The implications of this varied are explored below in the section entitled "Representitivty".

Table 1

Length of determined Improvement Programme in the enterprise (1996)

no. of years	no. of companies	company
none	3	O, J, M
within the same year (first year or less)	8	A, B, K, I, L, F, G, H
second year	2	C, E
third year +	1	N
no response	1	D

The plants were situated around the country and spanned across a number of sectors, as illustrated by Table 2 below.

[2] A brownfield site is an existing manufacturing facility, which would have to undergo a transformation if JMT's were to be adopted. A greenfield site is a newly established manufacturing facility, a clean slate so to speak.

Table 2

Sectors of participating companies

Company	Sector	No of companies in the sector
A	Pharmaceutical	1
B	Capital Equipment	1
C, E, G, J, L, O	Food & Beverage	6
F, N	Textiles	2
H	Motor Component	1
K	Paper / Paper Products	1
I	Motor	1
M	Basic Metal Industry	1
D	Electrical / Electronic	1

Each company has been assigned a letter of the alphabet rather than being identified by name. It is evident from the above table that Food and Beverage was the sector which had the most representation in the workshop, followed by textiles. The companies spanned 10 different industrial sectors, and included both continuous and assembly processes.

Selection of participants:

The invitation highlighted that the workshop focused on team based problem solving for shopfloor workers, and recommended that companies send a team of at least three people made up primarily of shopfloor people. The companies final choice of participants did not however affect their acceptance into the training, and some companies sent only one person. Table 4 shows the number of participants from each plant. Participants in all but one plant were selected by management. The only exception was in the auto plant where it was decided that the participants should be shopstewards and the shopstewards committee decided who should participate.

Table 3

Profile of participants by race and position in company

	White	Black[3]	Totals
shopfloor	3	46	49
non- shopfloor	8	15	23
totals	11	61	72

Table 3 provides a breakdown of the participants by race and their position in the company (broadly defined as shopfloor and non-shopfloor). A total of 72 people attended the BPI workshops. The majority of participants (49) were drawn from the shopfloor (including shopfloor management e.g. supervisors), and 23 were non-shopfloor personnel. It is evident from Table 3 that the majority of participants in the workshop were black, 61 out of 72. Of these, 8 were women. Women made up 11 of the total participants. Because the workshops were partly sponsored from Japan, the SA'n government stipulated that for recipients of aid no more than one third of the delegates may be White. This rule was applied to all three workshops, even though the second was not sponsored by the AOTS.

The cost for each participant was a considerable sum of R3000, including training materials, and excluding accommodation for those from out of town. The company which hosted the workshop could send two participants free of charge. The cost and length of the workshop (five days) was probably prohibitive for small and medium sized enterprises and this affected their representation in the sample. The implication for the research is that the findings are biased towards larger firms.

2.2 Research process:

The data for this research was gathered through a research session which followed the first workshop, through the BPI newsletter and from field research. Each of these is expanded on below.

[3] Black is used here to include groups previously discriminated against under apartheid including African, Coloured and Indian.

2.2.1 Research session and newsletter:

A **research session** was held after the first workshop. Each company was asked to select one of the participants as a research candidate who would be available to participate in a discussion following the workshop. The aims of this session were to get feedback on the workshop, and to discuss some of the key research questions. The researchers were asked to keep the research question in mind throughout the workshop and to give feedback in the research session. The data collected from the research session is included in the analysis in Chapter Four. The participants in the research session were generally not shopfloor workers, but included Training Officers, Continuous Improvement Managers, Human Resource Managers and Production Personnel.

The research participants were asked the following questions:

1. How does best practice fit in for them?
2. What is Best Practice?
3. Is Best Practice appropriate for South African Industry to achieve world class?
4. What role should the MRT play in assisting effective Implementation?

The session was facilitated by the MRT associate researcher, and the discussion was documented. I was a participant observer in the research session.

The BPI Newsletter:

The aim of the Newsletter entitled "Best Practice Update" was to facilitate communication between the participants in the hope that they would be able to assist and support one another in the implementation process across firms. The idea for the Newsletter came out of the research session. The participants were encouraged to send contributions relating their implementation experiences in their plants following the workshops. Many did, and this proved to be an important step in documenting their experiences. Three newsletters were produced in 1996, one following each workshop.

2.2.2 Field research:

The field research was conducted between November 1996 and January 1997. I chose to do field research in the form of site visits and in-depth interviews in order to gain a deeper understanding of the actual process of post-workshop implementation and to familiarise myself with the conditions in the plants.

Access was gained through the liaison person (the liaison person refers to the manager who booked the participants in on the training). As the research was focused at plant level, and I was documenting the post-workshop implementation experiences in the participating plants, the participants from Head Office were not interviewed for the final research. The Head Office participants did however participate in the Research Session. Two plants (with a total of 4 participants) did not participate in the research due to logistical concerns.

Table 4

Plants which participated in the field research

Company	Participating Plants	No. of Participants on workshop	No. of participants who took part in field research
A	1. Manufacturing and packaging plant	7	5
	2. Manufacturing and packaging plant	3	2
B	Heavy machinery manufacturing plant	5	4
C	Canning plant	5	3
D	Electronics plant	6	6
E	Brewery	1	1
F	Polymer extrusion plant	1	1
G	Food processing and filling plant	8	8
H	Tyre manufacturing plant	4	2
I	Auto assembly plant	2	2
J	Sugar Mill	1	1
K	Corrugated cardboard plant	4	2
L	Confectionery Plant	3	2
M	Lead Smelting and soldering	3	3
N	Textile Plant	8	5
O	Beverage Plant	4	3

In Table 4 it can be seen that the implementation processes were documented in 16 plants countrywide. Company A sent teams from two plants. These plants were in the process of merging at the time of the research. The implementation experience of the second plant which was due to be

relocated was not documented as part of this research, yet the individual experiences of the participants were recorded. Plants C and K belong to the same company.

a. Field research design:

The field research was designed with two purposes in mind. *Firstly*, to evaluate the effectiveness of the training workshops. This was the specific interest of the MRT at the time. This entailed finding out what the participants understood from the training and what they thought of it. The *second* purpose was to document the post-workshop implementation experiences, both for documentary purposes, and to investigate the issues which impacted on the implementation process. The question of effectiveness of the training and the value which the company extracted from the training was written up into a report for the Manufacturing Roundtable members and the participating plants. The investigation of the issues which impacted on implementation and which have implications for diffusion have been examined for this thesis. There are overlapping areas and those relevant for the investigation in this thesis have been included.

The method used to gather the information consisted of one hour long individual in-depth interviews with participants and the manager/s who booked them in on the training (referred to as the liaison person). I visited each plant to conduct the interviews. In most cases a participant took me on a factory tour. This gave me a greater insight into the nature of the manufacturing facility, as well as to the practices and culture in the plant.

The individual in-depth interviews were semi-structured, and an interview schedule was used[4]. One plant was used to pilot the interview schedule which was revised thereafter. For those sites where access was denied, yet which were willing to participate in the research, mail questionnaires were used which corresponded closely to the interview schedule[5]. Two interview schedules and mail questionnaires were drawn up, one for non-participants (mostly people in managerial or training positions) and one for participants. Some of the interviews were recorded, but I mostly took notes. In Table 4 it can be seen that in most cases almost all the participants were interviewed in each plant. This, together with the site visits, allowed me to obtain a complete picture of the implementation experiences.

[4] See Appendix One for the interview schedules
[5] See Appendix Two for the mail questionnaires

b. Profile of interviewees:

Of the total of 72 participants, 45 were interviewed, and 5 filled in questionnaires. 50 participants thus contributed to the post workshop follow up research. Of the total, 39 were from shopfloor level (80% of shopfloor level participants), and 11 were non-shopfloor (48% of non-shopfloor participants). Both groups were thus adequately represented in the research. The company liaison person in each company was also interviewed, and in some cases more than one manager was interviewed. Altogether 20 management people who did not participate in the workshops were interviewed by the researcher, and two filled in questionnaires.

c. Data analysis:

The research was intended to be inductive, I was not testing any assumptions but was rather interested in seeing what patterns emerged from the research which would then provide clues as the key factors which are likely to impact on diffusion. I was guided by a number of questions regarding the process of diffusion which I used to distil the data. These questions can be found on page 24 of Chapter One.

As this was a study of diffusion I wanted to capture the nuances of each individual plants experiences and found qualitative methods to be the most suited to this. I chose to document the experiences of all the plants rather than selecting few for a case-study as I wanted to establish patterns of diffusion.

The data was analysed in two different ways. *Firstly*, profiles were written of each plant, which formed part of the Evaluation Research report written for the members of the MRT and the participating companies. *Secondly*, the responses to relevant questions were tabulated across plants and post-coded. As the data was not entered into a data base this made the process of analysis quite cumbersome, and made cross tabulation difficult. No differentiation was made for instance between the different categories of respondents according to job category. It would have been interesting for example to be able to compare the responses of shopfloor workers, shopfloor management and non-shopfloor participants, to see if any interesting differences arose.

d. Methodological problems:

The self-selection of the participating companies could have resulted in a bias towards companies which were more likely to be adopting these kinds of techniques, and thus it could be argued that it

is not appropriate for a study of diffusion. However, if one considers the question of the factors which impact on the adoption process as important for understanding diffusion, then the self-selection of the participating companies should not pose a significant problem. The sample did include a broad spectrum of manufacturing practices ranging from traditional mass production in an authoritarian environment, to plants which had greater degrees of participation and had been moving along the route to 'world class' manufacturing for some time, one as many as four years. Eight of the plants were however only in their first year of implementation. This has both negative and positive implications. One negative implication was that it made addressing the question of systemic adoption difficult, as the process of systemic adoption is incremental, and I tested for this by trying to gain an insight into the managers understanding of the systemic nature of the techniques and to look for other clues such as the nature of teams established in the plant. The diversified sample was however useful as it enabled me to capture a broad spectrum of experiences and to identify the issues which arose at different stages of implementation or transformation.

As this is not a representative or broad sample, it is not possible to generalise the findings. What I can validly draw from this research are, however, the patterns and trends which emerged in the sample. I was able to distil the key issues which effect the *depth* of adoption in these plants, which provides clues as to the likely patterns of the *breadth* of adoption or diffusion in the SA'n manufacturing industry as a whole. This micro-study allows us to draw a clear picture of the kinds of issues which arose in the plants, and which one could say are fairly likely to arise in many plants in the country due to similar conditions related to the South African industrial landscape. The data collected is also presented against the background of empirical data collected in other developed and developing countries and similar trends were identified especially in the developing countries.

A further methodological problem concerns the **categorisation of the implementation processes** in terms of systemic adoption. The problem lies both in the research design and with the varied nature of the programmes in and between plants. A method for evaluating the companies' world class drive or manufacturing practices was not developed prior to the research being conducted and hence trying to categorise and rank their manufacturing practices has been a exercise in futility. There is also so much diversity between divisions in each plant that it is difficult to come up with a standard ranking for the plant as a whole. For instance, some divisions in the plant have natural work teams which meet daily, while others meet maybe once a month. For future research it would be beneficial to pre-code the questions and have the categories worked out before conducting the research. Also,

the open ended nature of the interview process was useful to gain in-depth insight into the plants and to probe the responses, but it did make it difficult to capture standardised answers to the questions. Perhaps a two phase process of in-depth interview plus a pre-coded survey would have allowed for more systematic data collection.

A problem which I encountered was trying **measure the impact of the improvement exercises** on the productivity of the implementation site as it was difficult to get access to records which would reflect the improvements over time. In most cases the data which could measure the improvements was not collected, or it was difficult to establish to what extent the participation in the workshop had impacted on the performance. Perhaps for future research it would be good if the plants actively participated in the research by collating data and measuring the success of the projects. The MRT played no role in post-workshop implementation, however, a more active role could have been played in monitoring the process. All the interviews were conducted at one time over a period of two months. This means that some of the participants had been back at their plants for many more months than others. Also, some plants sent people on two workshops and were able to benefit from the greater numbers of people who had been exposed and who could motivate each other.

A further problem was that the research **attempted to focus mainly on shopfloor practices**, briefly touching on organisational concerns or human resource practices. This emerged largely to due the fact that the interest of the MRT is focused on production concerns. The research was designed prior to the involvement of my academic supervisors from the Social Sciences. This was problematic as at the starting point of the research process I was quite closely allied to the 'technical' or 'universal' school (defined in Chapter One on page 19), and I attempted to use the model of Lean Production as my starting point for analysis. It became apparent to me early on in the literature survey that this approach was problematic and I refined my approach to the question of the usefulness of a model as a starting point for a study of diffusion quite considerably (this discussion is explored on page 22 of Chapter One). The survey design and research was conducted before the literature review, and contributed to this problem. An important lesson learnt has been to root the field research quite firmly in a clear understanding of the theoretical debates.

This problem of focus emerged even though for my Honours in Industrial Sociology I researched the implementation of a Total Quality and Productivity programme at Bisonboard Stellenbosch (Lomofsky, 1991). At that time I had little understanding of the technical nature of these

programmes, and focused on the organisational level changes. I did find however that organisational changes were not supported by the technical (i.e. teams were established but they were not engaged in problem solving but were used as forums to discuss bread and butter issues). This problem is largely routed in the reality of how change programmes are implemented. Often the tendency is to focus either on the technical side or the Human Resource aspects of implementation, and there is little recognition that the programmes are socio-technical. What is interesting is that this emerged as a major finding of this research, and having been caught in the trap myself makes the problem even clearer to me. I have come a full circle.

e. Reflexivity:

I was working on the BPI as the workshop project co-ordinator. I was involved in making all the pre-workshop arrangements and for facilitating the smooth running of the workshop. My involvement did not extend into the training, except briefly in the third workshop. I stated clearly at all workshops that I was present as a researcher and that my role was not that of a disseminator. I was however clearly associated with the project and also edited the Newsletter. This could have impacted on the responses which the participants gave to the questions. I sensed in some participants a desire to please the researcher and provide the 'right' answers. I addressed this by using probing questions. This was more evident when it came to questions about what the participants had understood from the training. When it came to speaking about their experiences at the plants I found the interviewees to be frank and open. I think I was seen as an objective person as far as their workplace was concerned. My participation in the workshops did thus not seem to negatively impact on the process of documenting the post workshop implementation experiences. The participants who had used ideas from the workshops were very keen to share with me what they had done, the problems which they had encountered, and the concerns which they had.

f. Validity:

The validity of this research design for a study of the pattern of diffusion could be questioned. The research process was designed to answer the question of how these Japanese shopfloor practices can be adapted to the South African workplace[6]. I used this research conducted by the MRT as a vehicle, although it was not a perfect vehicle. The research did provide very rich qualitative data. The use of the framework for analysing diffusion, which I found in the literature, to distil and analyse the data was one way to overcome this problem. I also focused on those questions which were most

[6] Whether the BPI action research project itself was an effective method to address this question is discussed on page 96 of Chapter Four.

applicable at plant level. It is primarily for this reason that I have approached the question of the breadth of diffusion from the perspective of the factors which impact on the depth of adoption in plants.

3. Chapter Outline:

In **Chapter One** I identify the key concepts and debates present in this thesis, and clarify conceptually the tools used in analysing the process of diffusion of Japanese Manufacturing Techniques. This provides the necessary background for a reading of the following chapters, and frames the debate within a study of diffusion.

In **Chapter Two** the question of whether Japanese Manufacturing Techniques represent a new production paradigm is addressed. The key principles underlying Japanese Manufacturing Techniques and their implications for labour are thus highlighted. It is argued that the adoption of Japanese Manufacturing Techniques does entail a significant paradigm shift with regards to the principles of production, yet the physical manifestation for labour may remain much the same. The embeddedness of the techniques in Japanese society is also highlighted, implying that without the institutional context which supports them, transfer to other national contexts is likely to be further complicated. The techniques are thus not likely to be easy to introduce, and it is probable that conflicts in the social relations of production will persist. These factors seem to militate against the rapid and steady diffusion of Japanese Manufacturing Techniques.

Chapter Three focuses specifically on the transfer of Japanese Manufacturing Techniques to enterprises in Developing Countries. The difficulty of introducing the systems and the degree to which the techniques are seen as systemic are the key analytical questions addressed. A relationship is drawn between the depth of systemic adoption in firms and the breadth of diffusion across industry. It is argued that the factors which impact negatively on the systemic adoption in firms are likely to hinder the rapid diffusion across industry. Factors specific to developing countries which inhibit systemic adoption are highlighted. The identification of these factors assists with the analysis of the research results presented in Chapter Four.

Chapter Four is an examination of the results of implementation experiences in fifteen plants which participated in training workshops in South Africa. As this is not a representative sample of companies the conclusions can not be generalised, certain 'principles' at work have been identified.

The intention of the chapter is to identify pointers which may affect the diffusion of Japanese Manufacturing Techniques to plants in South Africa.

Chapter Five is the concluding chapter, where I discuss the findings of the research in terms of the two key questions identified in the following chapter regarding the nature of diffusion, informed by the discussions and empirical evidence presented in Chapters Two, Three and Four.

Chapter One: Key concepts, debates and tools for an analysis of diffusion:

1. Introduction:

The purpose of this chapter is to define the key concepts, debates and tools which I use in this thesis, as well as to introduce some parameters for analysing the diffusion of Japanese Manufacturing Practices, as provided by Humphrey (1995a). Japanese Manufacturing Practices are often presented as a universally applicable model in the management literature. Evidence suggests however, that there is often a large discrepancy between the much vaunted model of Japanese management, and the "real world conditions" in which they have been implemented (Posthuma, 1995:p. 103). Below I present three views which highlight different analytical approaches to understanding the process of the diffusion of Japanese Manufacturing Techniques. These approaches are; the Universalistic Approach, the National Approach and the Firm Centred Approach. I do so in order to define my approach to the analysis of Japanese Manufacturing Techniques. Following Humphrey (1995a) I argue that viewing the techniques as a universalistic model does not guide an analysis of the trajectory of diffusion, which is the central theme of this thesis. My position is located between the national and firm centred approaches, recognising the embeddedness (Granovetter, 1990) of the techniques in the Japanese institutional and social context and identifying Toyota as the innovating firm. Following this, I present the questions which guide an analysis of the speed and nature of diffusion and identify three possible paths of diffusion.

2. Clarification of terms:

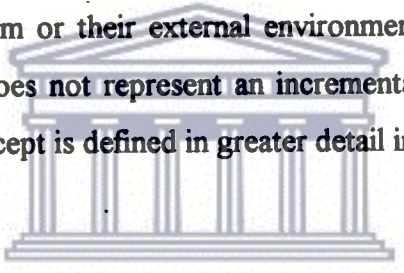
Below I clarify two key terms which occur frequently throughout the thesis being systemic adoption and diffusion.

2.1 Systemic adoption:

A concept which arises often and on which much depends is that of **systemic adoption**. According to Kaplinsky (1995:p. 58) "systemic" adoption refers to "... the co-ordinated adoption of different individual elements of production, be these embodied or disembodied technologies, plant or firm-level techniques, or any combination of material or immaterial processes.". The techniques of

Japanese management[1] can be applied as stand-alone changes in procedure applicable across a range of production systems, or they can be applied as part of an integrated and co-ordinated production system. The latter is referred to as 'Systemic adoption', and what is critical is the way that the different factor inputs are organised (Kaplinsky, 1995:p. 58). Kaplinsky (1995:p. 58) argues strongly that the greatest competitive advantages are gained when the various Japanese production techniques "... adopted as part of a wider, co-ordinated package of measures", and that the techniques feed synergistically into one another. However, improvements can be made even when techniques are adopted individually. This relates then to the depth of adoption of Japanese Manufacturing Techniques in implementing firms, which impacts on an analysis of the breadth of diffusion across firms.

A **'systemic gap'** implies that some firms will be capable of reaching deep forms of systemic adoption, while for others this process would be intrinsically constrained, either by their sector of operations, factors internal to the firm or their external environment (Kaplinsky, 1995:p. 62). In such cases the pattern of diffusion does not represent an incremental curve, but rather shows two different paths of adoption. This concept is defined in greater detail in Chapter Three.



2.2 Defining technological diffusion:

Diffusion refers to the spread of a new technology across a potential market. Japanese Manufacturing Techniques can be considered to be a soft technology. Neo-Schumpetarians define technological change as being comprised of three aspects; invention (the creation of new ideas), innovation (the development of those ideas into a new technology) and diffusion. Diffusion thus relates to the use and application of the new technology in contexts other than where it was developed (Stoneman & Diederen, 1994:p. 918). Innovation also occurs in the process of diffusion as the technology is used and adapted to suit the needs of the using firm. It is thus probable that the shape and nature of the techniques are likely to change in the process of diffusion (Freeman, 1994:p. 474/5).

[1] The techniques of Japanese Manufacturing are described in detail in Chapter Two

3. Analytical approaches to a study of Japanese Manufacturing Techniques and diffusion:

Humphrey (1995a: p. 149) highlights that new paradigms of industrial organisation have been codified into a number of different 'models' which include flexible specialisation (Piore & Sabel, 1984), lean production (Womack, Jones & Roos, 1990), systemofacture (Hoffman & Kaplinsky, 1988), post-Fordism (Jessop, Bonnet, Bromy & Ling, 1988), the new competition (Best, 1990) and industrial districts (Sengenburger & Pyke, 1991), (in Kaplinsky, 1994:p. 11; Humphrey, 1995a: p. 149). Each model, Humphrey argues, is an abstraction of reality which emphasises a different element considered to be critical for success. "It is often claimed that the model represents a decisive break with established forms of production offering substantial improvements in performance." (Humphrey, 1995a: p. 149).

I prefer to use the terminology of **Japanese Manufacturing Techniques** to highlight that the focus of this thesis is on the *production* systems developed to improve the efficiency and effectiveness of *shopfloor* operations. The locus of investigation is thus *shopfloor enterprise* level. As such other firm level organisational changes, such as intra-firm networks and supportive human resource practices are only briefly discussed, but are important to mention as they form part of an integrated system. The area of supplier relations is considered in so far as it relates to the embeddedness of the techniques.

By referring to *'Techniques'*, I aim to distinguish my position from those that use models as a starting point for analysis. I prefer rather to identify and examine the key principles which I consider to underlie manufacturing practice in Japan. My position is further defined below.

A debate in the literature focuses on the extent to which Japanese Manufacturing Technique's constitute a distinct package of techniques, which have a universal application, and which will enhance productivity, competitiveness and quality of work life. Elger & Smith (1994) provide a framework for understanding the different approaches inherent in the terminology used by the various authors on Japanese Production Management[2]. They classify most of the writings according to three categories namely Universalistic Models, National Models and Firm centred approaches. It

[2] Terms which are frequently used in the literature to refer to Japanese Manufacturing Techniques (JMT's) are; Lean Production (LP), World Class Manufacturing (WCM), Japanese Management Systems (JMS), Toyota Production System (TPS), Total Production System (TPS), Continuous Improvement (CI), The New Competition.

is useful to clarify these terms as they indicate a differentiated analytical approach. My approach falls between the National and Firm centred approaches. I argue that the techniques can be successfully implemented outside of Japan, while I recognise that there is a degree of embeddedness[3], for example the system of tiered supplier networks and supportive Human Resource Practices.

3.1 Universalistic models:

The most influential and well known examples of the universalistic view are those espoused by the likes of Schonberger, author of Operations Management Text Books used in business schools around the world, and Womack et al (1990) in the their book "The Machine which Changed the World" which emerged from research conducted in the International Motor Vehicle Program (IMVP) at the Massachusetts Institute of Technology (MIT). The term Lean Production was coined by Womack et al (1990), when describing the Toyota Production System and the book has been significant in generating interest in and in diffusing the concepts of Japanese Management globally. The authors make bold claims regarding the superior efficiency of Lean Production over Mass Production and they argue that it has substantial cost advantage because 'it uses less of everything compared with mass production - half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time' (Womack et al (1990), 1990:p. 13). It is argued that not only is this system more efficient but it is also more worker friendly and empowering, and should be adopted by manufacturing concerns the world over: "Clearly, we think that it is in everyone's interest to introduce lean production everywhere as soon as possible, ideally within the decade." (Womack et al (1990), 1990:p. 256).

Critics of this approach such as Williams, Haslam, Williams, Cutler, Adcroft and Johal (1992) argue that the competitiveness of Japanese firms is exaggerated as the authors ignore other features of comparative advantage such as high capacity utilisation, intense work pace, long working hours and a network of component suppliers offering low wage labour. The universal applicability of these production innovations is thus questioned. Such criticisms thus highlight that the reality is more complex "... than that depicted in the imagery of the evolutionary triumph of lean production." (Elger & Smith, 1994:p. 3). Elger & Smith (1994) also highlight that depicting the model as a new

[3] For a discussion on embeddedness see Granovetter, 1990

and progressive paradigm is a weakness as this approach tends towards overinterpreting the significance of events, and ignores the terrain of conflict in the labour process.

3.2 National models:

Writers working within the tradition of National economic models have chosen the terminology of Japanisation in order to highlight the institutional and social contexts in which Japanese production techniques evolved. They argue that these factors make adoption and transfer to other national contexts difficult. One school of thought on this issue highlights that these institutional differences place major constraints on adoption and that the rhetoric of Japanisation provides an ideological justification for changes in labour process which have little to do with established Japanese ways of working (Ackroyd et al, 1988 in Elger & Smith, 1994:p. 6).

Another school of thought, embodied in the writings of authors such as Oliver & Wilkinson (1992 in Elger & Smith, 1994:p. 7) is less critical. While they recognise that the success of some Japanese corporations has much to do with the network of social and economic relations in Japan, they argue that other ways can be found to secure the worker commitment necessary for implementation in other national contexts.

Elger & Smith (1994:p. 7) suggest that Oliver & Wilkinson fail to critically interrogate "... the extent to which human resource management genuinely reconstructs employment relations or supports innovations in production, or more broadly of the relationship between consent and coercion of employees in a period characterized by fears of redundancy and the marginalisation of trade unions." (Elger & Smith, 1994:p 7). As such, Elger & Smith (1992:p. 7) argue that Oliver & Wilkinson don't offer definitive conclusions and hence the term Japanisation signifies an open agenda of investigation rather than offering a vision of the scope and character of the diffusion of Japanese Manufacturing Techniques.

3.3 Firm centred approach:

The third approach uses the terminology of the innovating firm, hence Toyotism. Elger & Smith suggest that writers such as Dohse et al (1985 in Elger & Smith, 1994:p. 8) use this terminology to

highlight three factors. *Firstly*, in order to challenge the notion of a radical transformation in work relations and suggest that "... Toyota has pioneered methods that extend rather than supersede the existing logics of mass production, by providing new ways in which to rationalise and intensify the work process." (Elger & Smith, 1994:p. 8). *Secondly*, they wish to investigate further the issues raised in the Japanisation debate regarding the specific employment relations and conditions surrounding developments at Toyota[4]. Lastly, by using the terminology of the firm, they suggest that the use of these techniques has been uneven within Japan, the country of first diffusion, let alone limited outside of Japan. By recognising this the authors "... avoid any assumption of a homogenous Japanese model or generalized contrasts between Japanese and non-Japanese enterprises." (Elger & Smith, 1994:p. 9). Hence, they recognise that there is no one ideal type of production system and that management objectives and priorities differ. The implications of this are that all variants will carry with them real dilemmas and conflicts (Elger & Smith, 1994:p. 9), and are likely to change in the process of diffusion.

I use the terminology **Japanese Manufacturing Techniques**, and focus on the techniques developed by Toyota. My position falls between the National and Firm centred approaches. I recognise the weakness in the universalistic approach. While the techniques themselves may be universally applicable, they did emerge within a specific institutional and social context which can not be ignored, and they are being transferred into a completely different context. This makes the process of diffusion difficult. Like Elger & Smith, I believe that identifying the techniques with Japan leaves an open agenda for the discussion of diffusion. I also recognise that diffusion has been uneven in Japan and in Japanese enterprises abroad, and that Toyota does represent what Kaplinsky (1995:p. 59) refers to as the "Eastern Archetype". Further the objectives and priorities of all the stakeholders are likely to influence the type of production system implemented, as well as the character and nature of the systems designed to support them. These arguments are developed further in Chapters Two and Three.

[4] Originally the techniques were referred to as the 'Toyota Production System', but as they were adopted in other Japanese enterprises, who did not want to be associated with Toyota, the term was changed to 'Total Production System'.

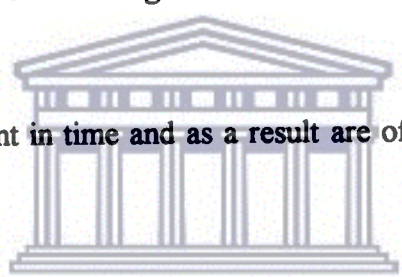
4. From models to trajectories:

The dominant mode of discourse in the management literature is concerned with the model of Lean Production (LP) or World Class Manufacturing (WCM) [5] and focuses on the universal applicability of these production techniques, and poses a dichotomy between Mass Production and Lean Production. The problematic of presenting models in their pure or abstracted form, and the implications of this for understanding diffusion

(Humphrey,1995a) are presented below.

4.1 Limitations of using models for analysing diffusion:

Humphrey (1995a) argues that codifying experiences into models brings with it a host of limitations, and that the focus of policy makers should rather be on the process and depth of diffusion. He highlights a number of serious limitations of using models:



1. Models focus on a frozen moment in time and as a result are often outdated and fail to capture the forces behind change

2. Many of the models presented are highly prescriptive. This is problematic for two main reasons:

a. *Firstly* because a "broadly applicable prescriptive model inevitably abstracts from the social context in which the model is developed." (Humphrey, 1995a: p. 151). The Lean Production approach involves a radical delinking of industrial organisation and its social conditions, and firms are lead to consider techniques without considering questions of labour relations or labour market conditions. Thus, the issue of the influence of the social context on the implementation of lean production is not considered when discussing the replication of the model in a different environment (Humphrey, 1995a: p. 151).

b. *Secondly*, the focus is on factors which are within the power of management to change. Thus the factors outside the control of management are systematically ignored, and failures are attributed

[5] "A perusal of the management press, industrial engineering literature and information disseminated by organisations geared to the promotion of productivity in South Africa shows that the concept of 'world class manufacturing' is emerging as the local variant of post - Fordist thinking." (Ewert, p.: 2)

solely to poor management. This is problematic for policy makers concerned with the development of sectors as they need to know what kind of companies will be able to make optimal use of these techniques and the critical success factors which effect implementation.

3. "Models concentrate on codifying practice at the point of origin of the model." (Humphrey, 1995a: p. 151). Thus, Humphrey argues that questions of process which would interest policy makers are ignored. Because the end state of successful adopters is considered, questions about how industry can move from where it is now to where it would like to be in the future are not addressed. By focusing on the point of origin, the issue of fusion between new and existing models and hybrid forms are not considered.

4. Lastly, Humphrey argues that often what is presented is a set of stylised facts rather than a model. Since these are constructed from many different case studies, the distinction between incidental and crucial factors becomes unclear, and often causal relations remain unexplained.

"For these reasons, defining a model and then using it as a blueprint for analysis and policy in another context is an exercise with severe limitations." (Humphrey, 1995a: p. 152.) Rather, the process of transfer should be analysed, and the factors which influence the speed and nature of adoption should be considered. This means the process of diffusion of organisational change should be considered. This is the argument which is advanced in this thesis. In the following chapter, rather than describing the model of Japanese Manufacturing, I present the key principles underlying the system.

5. The nature of diffusion:

The path of diffusion of the Japanese Manufacturing Techniques seems to be open to many different interpretations, depending on the assumptions of the analyst. Humphrey (1995a) identifies five questions which assist with an analysis of the process of diffusion. How one answers the questions, will influence how one interprets the possible path of diffusion. The questions underlying the analysis and the three possible scenarios for diffusion are presented below.

5.1 **Questions used in the analysis of the process of diffusion:**

1. Is Competitive pressure a good catalyst for the adoption of the new production methods?

2. Are Japanese Manufacturing Techniques the only and best way to meet competitive pressures amongst a range of industries and firms?

3. Are the systems easy to introduce or do they require fundamental changes to the social relations in the firm and a new approach to production management requiring certain technical capabilities?

4. "Is JIT/TQM a set of principles or techniques whose effectiveness depends to a large extent on the adoption of a complete package of interrelated changes?" (Humphrey, 1995a: p. 153), (i.e. the extent to which the paradigm is seen as systemic)

5. If one firm adopts the new production methods, does this mean that it will have to redefine its relations with other firms?. (Humphrey, 1995a: p. 153).

One's view of the how the Japanese Techniques are likely to diffuse will be affected by how one answers these questions. Three possible paths of diffusion namely rapid, steady and uneven can be identified and are outlined in turn below.

Questions three and four are the primary questions investigated in this thesis. Question Three is addressed in Chapter Two, and Question Four in Chapter Three. These are the questions most directly related to **firm level** implementation. My view with regard to Question Four is that the **long term** sustainability and success of the techniques does depend on systemic adoption, and I thus investigate the issues which are likely to impact on this process.

6. Three possible paths of diffusion:

6.1 Rapid diffusion:

This scenario paints a picture of rapid diffusion of the new production methods and foresees the widespread systemic adoption of the principles of Japanese Production Management. The arguments which support this are that;

The techniques are applicable in a wide variety of industrial settings (continuous process to job shop) (Bessant, 1991:p. 24 in Humphrey, 1995a: p. 153)

The techniques are simple to introduce and can provide rapid improvements in performance

Humphrey continues to suggest that rapid diffusion will take place if the following assumptions are in place:

a. the new techniques represent a new production system

b. they are easy to introduce and knowledge about how to introduce them is widely available

c. that competitive pressures in the economy are strong

d. that the success of implementation lies within the power of management

While unevenness would remain if all these conditions were in place, the trajectory of diffusion is seen as being widespread and fairly rapid, as there are no fundamental obstacles.

6.2 Steady diffusion:

The 'steady diffusion' scenario like that of 'rapid diffusion' also assumes that competitive pressures are strong and that the new production systems are a key source of competitiveness which are applicable across a broad spectrum of industry. However, the steady diffusion scenario does not consider the adoption of the new techniques as being easy. They emphasise that the techniques require a fundamental paradigm and organisational shift which is not easy to achieve and that all the factors are not within the control of management (Humphrey, 1995a: p. 154). Firms may make progress towards the systemic adoption of the new manufacturing techniques, but change will be "long and painful" (Humphrey, 1995a: p. 154). The adoption requires so many related changes, including both social, political and technical changes, changes in accounting and in perceptions related to competition and co-operation, that it might be overwhelming for a firm (Humphrey, 1995a). Often, it takes firms three "kick off's" or relaunches to regain commitment to the program before the process is firmly on the way (Mr Furuhashi, BPI workshop, Jan '96). Firms thus often have difficulty sustaining the advances which they may have made in the successful adoption of the new techniques.

Furthermore, if firms are to get compliance from labour, they need to find substitutes for the 'three treasures'. "The ideal situation for management would be one where they can achieve, and reward, labor flexibility, involvement and performance and provide good prospects for long term employment." (Humphrey, 1995a: p. 154). These conditions of employment are however not entirely up to management and they have to negotiate with unions and operate within established labour rights. The successful adoption of the new system also relies on suitably qualified labour and for suppliers which are reliable (Kaplinsky, 1995:p. 154).

Firms will have different capabilities with regard to the adoption of these techniques and this will effect the pace, extent and nature of adoption. Small firms might need institutional support (private and public) to encourage and assist them with adoption (Humphrey, 1995a: p. 155).

The 'steady diffusion' scenario is thus one of slow progress towards systemic adoption of the new manufacturing paradigm. Authors with this view would foresee the increased competitive pressure resulting from trade liberalisation pushing firms in the direction of adopting JMT's, and that the gains of the new techniques are only achievable if . They also argue that because the gains of the new techniques are only achievable and sustainable if adoption is approached systemically, that firms would follow the systemic route (Humphrey, 1995a: p. 155). As Wilson et al (1995:p. 98) argue, firms will begin with tools such as Statistical Process Control (SPC) as they achieve normalisation they should drop these simple tools and move onto others. The rate of adoption is thus progressive as firms become better learners. My experience suggests however that many firms never progress beyond the first phase of adoption. Some firms for example choose to use stand alone techniques and thus might not see the benefits of strategic adoption and give up the process when the next "fad" comes along[6]. I argue that it can not be concluded that because the most competitive gains of the new techniques are achievable with systemic adoption, that firms will follow a systemic route.

[6] What Mr Furuhashi referred to as the Blue - bird syndrome. He suggested that, even in Japan, it is often up to the shopfloor workers to sustain management's interest in the programme by inviting management to presentations on improvement activities on the shopfloor for example.

6.3 Uneven diffusion:

The uneven diffusion scenario includes the same difficulties of adoption as the steady diffusion scenario but adds three other assumptions. *Firstly*, that the systems do not need to be implemented as a whole system, and even tools used in isolation will bring results. *Secondly*, some products can be made competitively without the systemic adoption of the new production methods and lastly, that the degree of change required in the firm and the difficulty of implementation increases as the use of the methods become more systemic. "The result would be that many firms would adopt some limited elements of JIT/TQM, but the systemic adopters would be much rarer. The forces pushing the limited adopters in the systemic direction would be weak, and offset by the barriers to systemic adoption. At the very least, extensive institutional support would be needed to ensure widespread diffusion of systemic JIT/TQM." (Humphrey, 1995a: p. 155).

It is argued that firms which attach the adoption of specific techniques to company strategy are more likely to adopt a systemic approach (Ruas & Antunes, 1991:p. 3 in Humphrey, 1995a: p. 155). Thus policy makers should target firms which have clear strategic objectives and which know which tools can meet these. Ruas and Antunes argue that firms which adopt certain techniques as part of crisis management will not develop the capacity to become systemic adopters at a later stage. "They are not on the bottom rung of the JIT/TQM ladder, as would be implied by the 'steady diffusion' scenario. They are on a different and much shorter ladder altogether." (Humphrey, 1995a: p. 155). Murry (1993 in Humphrey, 1995a: p. 155) argues that this is what happens to mass producers who introduce these techniques. If they pursue quality objectives without aiming to achieve flexibility and innovation, the limited use would meet the aims of the firm at the time, but would ultimately probably not improve their competitive position.

Thus, this scenario would be consistent with an image of firms who would see the radical changes and complexity of introducing World Class Manufacturing as expecting too much, and who don't want to make radical changes to management structure and labour practices. They would thus be unwilling to accept the paradigm shift which goes with the new techniques. If this is the correct scenario then one can expect widescale and persistent differences in adoption, and that the extent and nature of the systems will vary according to environmental influences of the firms and the sectors in which they operate (Humphrey, 1995a: p. 156). It would also depend on the influence of other stakeholders such as unions. The uneven diffusion scenario represents the "systemic gap". This, Humphrey warns, means that caution is necessary. The focus on industry leaders and innovators

could be deceptive, and that while they may show the potential for change, there may actually be few followers behind them.

7. Conclusion:

In this chapter I define my use of the term Japanese Manufacturing Techniques. The word *manufacturing* highlights that the locus of investigation is concerned with the operation at shopfloor enterprise level. The use of the term *Japanese* highlights that the techniques originated in Japan, and I have suggested that presenting the Japanese Manufacturing System as a universally applicable model is not useful for analysing the process of diffusion of the techniques. Rather, it is important to recognise the institutional and social context in which they have been developed. I also highlight that Toyota should be regarded as the innovating firm and that the techniques developed there are likely to change in the process of diffusion.

The nature of the process of diffusion is likely to be affected by a number of factors. It is also open to differing interpretations depending on ones assumptions when answering questions related to diffusion. This thesis addresses two primary questions which underlie an analysis of diffusion, in order to come to a conclusion regarding the path of diffusion in SA. These questions are concerned with firm level implementation and regard the extent to which the techniques represent a new paradigm (Question Three), and the approach to systemic adoption (Question Four). It is my assumption that, with regard to these two aspects, the uneven diffusion scenario is the most likely possible scenario for the diffusion of Japanese Manufacturing Techniques to South Africa and other developing countries. Empirical evidence presented in this thesis seems to support this assumption. Guidelines for evaluating the process of diffusion have thus been established.

The aim of this Chapter has been to provide sufficient background to the reader regarding the approaches adopted by the researcher in the following chapters. Chapters Two and Three entail a detailed discussion and summary of the critical debates on Japanese Manufacturing Techniques.

In the following chapter the question of the extent to which the Japanese production system represents a fundamental change in the organisation of production and the social relations within the firm is addressed. This requires an examination of the techniques, the principles which underlie them, and a discussion of the implications for workers.

Chapter Two: A new paradigm in production?

1. Introduction:

The aim of this chapter is to address the question: Are the systems easy to introduce or do they require fundamental changes to the social relations in the firm and a new approach to production management requiring certain technical capabilities? This is one of the five questions underlying an analysis of diffusion, as presented in the Introduction. In order to answer this question the distinguishing characteristics of Japanese Manufacturing Techniques are discussed in detail and the implications for the workers discussed. The key principles identified are a) the elimination of waste, b) the elimination of uncertainty in production and c) the principle of Continuous Improvement.

In terms of the principles of production, the Japanese Manufacturing Techniques do represent a new production system, but the use of the techniques themselves does not necessarily imply an improved quality of work life for labour and could represent high-tech Taylorism. I argue thus that there are certain continuities with mass production specifically with regard to the implications for labour. Workers perceptions of, and responses to this is, are also likely to shape the pattern of diffusion, and have to be considered. The nature of diffusion is not pre-determined by the changes in techniques, and much still depends on factors such as the culture and power balance in the plant. It can not be assumed that adopting the techniques themselves will bring about changes in the social relations of production, as is often proffered in the management literature, and conflicts in the workplace are likely to remain. The system still requires workers commitment to establishing it at the required levels of efficiency. Thus, in order to sustain the technical changes, social innovations will need to occur. The universal model looks at the techniques in isolation of the social and institutional context in Japan which support the technical innovations. Failure to recognise this means that an accurate picture of diffusion is not provided. When we talk about transfer we need to acknowledge that systems designed to gain the consent and commitment of labour will be critical to the successful adoption of the techniques. In the absence of the social innovations, the adoption of the techniques themselves is impeded.

In light of the above it is evident that posing the terms of the debate (as is done in much of the literature) in terms of two competing models of productive efficiency; mass production vs. lean production ignores the continuities between the two systems, the recognition of which is critical for a

realistic analysis of diffusion. It is important to recognise that there is more than one model of productive efficiency and that the choice of production technique and manufacturing strategy needs to be aligned to the firm's competitive strategy. Recognition of these factors has two implications for diffusion, *firstly* that adopting techniques which are not appropriate for the firms competitive strategy is not likely to improve competitiveness, and *secondly* that they are not likely to be adopted by firms competing in other terrains. It is argued thus that rapid, widespread diffusion is not likely to take place. This point is raised following a detailed examination of the key principles underlying Japanese Manufacturing Techniques. The chapter begins with a discussion of the ascendancy of Japanese Manufacturing Techniques.

2. Background to the ascendancy of Japanese Manufacturing Techniques:

Lean Production or otherwise known as the Toyota Production System (TPS)[1] was devised by Eiji Toyoda, an engineer, and Taiichi Ohno, a production engineer. They implemented their ideas in the Toyota Vehicle production company in Japan in the 1950's. The systems are now diffused in Japan, and around the world, and are made up of many elements, combining common principles, in what is referred to in Japan as Kaizen[2] programmes. It is argued that the dominant mode of production in the 20th century was developed in the American automobile industry by Ford, and the New Competition emerged in the Japanese Motor Industry, prompted by Toyoda. Kaplinksy highlights that Toyota followed a sequential route of adoption gradually developing new techniques which developed into a tightly woven system (Monden, 1983 in Kaplinsky, 1995:p. 61).

2.1 The decline of Mass Production:

Much of the current literature on manufacturing operations focuses on the challenge to mass production which is posed by firms adopting new principles of productive efficiency which arose out of Japan, specifically in the Toyota company. It is argued that the recent decline in the mass manufacturing industry lies in its failure to adapt to changing circumstances (Wilson, Ballance & Pogàny, 1995:p. 1).

[1] also referred to as Total Production System, as other implementing companies do not want to be identified with Toyota

[2] Kaizen is the Japanese word for "to do some good", understood in the West as Continuous Improvement

The face of the twentieth century was shaped by the rise of big business and managerial capitalism spurred by mass production and the economic theories which arose around it, such as Kenyesian economics and the welfare state. These social and economic policies were intended to maintain wage levels and hence purchasing power, ensuring the consumers necessary for mass production. The Mass Production System became a dominant industrial force throughout the world in the 20th century. The system is based on the standardisation of product (interchangeable parts), process (moving assembly line) and labour (deskilling). Writers on Fordism (such as Jessop, 1991) argue that the concept was based on expanding markets through cheap products and was dependent on stable mass consumption. The aim of standardisation was thus to achieve long production runs which would lower unit costs, allow prices to be cut and be able to provide cheap goods to more people. Mass production was thus linked with mass consumption[3] (Mathews, 1994:p. 13).

Hence, proponents of Japanese Management argue that old production systems make sense in the world of mass production, but as mass production looses its dominance, so too do the business and workplace strategies that made sense within it. Now when rapidly changing markets call for quick responses from firms, the rigidity inherent in Mass Production becomes a source of weakness (Mathews, 1994:p. 13).

2.2 Forces giving rise to the new competition:

According to Mathews there are a number of forces to which the new production concepts owe their origins; "On the demand side, these include the trends towards market segmentation and product innovation; on the supply side, there has been the pursuit of flexibility and quality assurance through the development of new work organisation systems such as teamwork and programmable flexible manufacturing and assembly systems. In terms of value-added goods and services, these organisational innovations have given firms adopting them a competitive edge over firms which are still engaged in large-scale mass production as their strategy." (Mathews, 1994).

[3] Elger & Smith argue that this notion of Fordism has been employed in an overextended fashion, with the result that aspects such as collective bargaining, mass trade unionism, working class consumption and the associated production system come to be seen as interdependent and mutually reinforcing features of a totality which exist until challenged. This, Elger & Smith (1994:p. 11) argue, means that "... the uneven and syncopated relations between these developments are suppressed and tensions and contestation are banished to periods of transition.".

Opinions regarding the reasons for changes in today's markets differ: some argue that the volatility in markets is greater than before, some see the accelerated pace of technological change as the reason and others refer to the internationalisation of markets through globalisation. Wilson et al (1995) argue that whatever the interpretation, there are several easily identifiable macroeconomic and microeconomic forces which lie behind these changes. Between the 1950's and the 1970's, the world economy grew at a much faster rate than before (Madison, 1982 in Wilson et al (1995) p. 1). This period has been characterised by economists as the 'Golden Age' in which rapid output growth was widely diffused throughout the global economy. Also, since the annual expansion of trade almost doubled that of output, it became "... increasingly difficult to separate out different national economies and the firm - that is, the transnational corporation - assumed growing importance in economic planning and growth." (Kaplinsky, 1994:p. 9). This signifies a growing relative autonomy of the transnational corporation. There was a noticeable decline in both trade and output following 1973[4] (Kaplinsky, 1994:p. 9). The reasons for this are still being debated, and include the oil crisis of 1973 and transition in 'production system' which relates to shifts in competitive conditions (Kaplinsky, 1994:p. 9).

Fordism began to manifest structural problems in the late 1970's including declining productivity growth, and an increasing gap between productivity and wage growth. At the level of the firm it manifested in poor quality control and structural overcapacity (Ewert, p:2).

The world economy has been undergoing changes in the nature of investment planning, macroeconomic policies and international economic relationships which introduce some degree of uncertainty. It is argued that sources of volatility are often policy induced such as wide swings in exchange rates, the liberalisation of capital markets and the large scale movements of capital. On the microeconomic front firms are constantly reducing the times for product development and the pace of technological change is also being accelerated (Wilson et al, 1995:p. 1). Consumer markets are also changing and Fleury (1995) argues that because Fordism was the traditional organisational model following W.W.II when there was a sellers market, and everything which was produced was consumed, the Fordist strategy was considered to be competitive. However, since the buyers market arose in the 1970's, the actual characteristics of competitiveness became evident and gained real significance.

[4] It must be noted that of the six countries from which this data is drawn, only one is Asian. This could represent a Western bias.

Also, with internationalisation markets are no longer national, but international. Many countries are moving away from inward-oriented development strategies, and as such competitiveness becomes an important concern (Meyer-Stamer, 1995:p. 143). Globalisation can have serious negative implications for countries and firms which are ill-prepared to adapt, especially in terms of the balance of trade, employment creation etc... (Khor, date unknown:p. 1). The new manufacturing techniques may be a way of helping to achieve this. Wilson et al (1995) argue that this means that "methods of management, the organization of production lines and the shop-floor procedures which are employed are more important than in the past. The way a factory is organized and operates matters most in this emerging age of manufacturing." (Wilson et al, 1995:p. 3). Many companies the world over, in industrialised and developing countries are using methods developed in Japan in an attempt to meet Japanese competition (Humphrey, 1995a: p. 149). In his book called "The New Competition" , Best's (1990) central argument is that the source of mass production firms inability to compete is based on the fact that they are organised according to principles of rigid command and control of production, which is not appropriate for increased volatility and differentiation in today's increasingly global markets. He argues that if they fail to restructure according to the organisational principles of the new production paradigm, they will not be able to compete against firms which do (Best, 1990:p. 7). The key principles of Japanese Manufacturing Techniques are discussed in detail below.

3. Key principles of Japanese Manufacturing Techniques:

Humphrey (1995c: p. 2) highlights the four key elements of the Japanese model; a. elimination of waste in production, b. networking within firms through team work as opposed to managerial hierarchies, c. an institutional environment of occupational structures, pay and management systems which are designed to involve, motivate and control workers, and lastly d. supply chain management and networking between firms.

This dissertation is primarily concerned with looking at the aspect of the reorganisation of production or work organisation and the arena of shopfloor employees involvement in continuous improvement. As such it is the principles of production which are discussed in detail.

The innovations of Japanese manufacturing management are commonly recognised in terms of the packaged programmes developed in the Toyota Production System namely Just In Time (JIT), Total Quality Control (TQC) and Total Productive Maintenance (TPM). It is however the underlying principles which are of primary importance, since the principles which were developed in Toyota have been combined in different companies, in many countries, in numerous ways (Mr Furuhashi, BPI Workshop, Jan '96). In this section I identify the three key principles on which Japanese production management are based and which I believe represent the major departures from mass production. The foundation principles which characterise the Japanese Manufacturing Paradigm are *firstly*, a focus on the elimination of waste, *secondly* an elimination of uncertainty in the production process, and thirdly the philosophy of Continuous Improvement (CI). These principles translate into a focus on process throughput efficiency, statistical process control and the concept of the learning firm respectively. Each of these principles is detailed in turn below.

3.1 Elimination of waste - the principle of productive efficiency:

The new production paradigm has a different starting point for understanding productive efficiency. While in mass production the focus was on reducing costs by increasing *operational efficiency*, in the Japanese system, the focus is on increasing *process efficiency*. This, it is argued, posits a fundamental difference in understanding the source of success and competitiveness.

Operational Efficiency focuses on the time during which material is physically being transformed by machining operations. *Process Efficiency*, considers both productive and unproductive time as part of the efficiency equation and takes into account the total time that it takes for a product to move through the factory. "Process Throughput Efficiency is the ratio of the time a product is being transformed to the time it is in the production system." (Best, 1990:p. 148). For Mass Producers, Operational Throughput Efficiency is the key indicator of success, and is measured in terms of productivity per labour or machine input hour. Studies which have been conducted in industrialised countries have shown that often materials and inputs are worked on or manipulated for as little as 1 - 2 % of the time spent in the factory. (Wilson et al, 1995:p. 14).

In the Japanese conception, all unproductive time is considered waste, and the seven key sources of waste are (Suzaki, 1987):

1. overproduction (producing more than is demanded)
2. waiting time (jobs waiting to be processed)
3. transport (inventory being moved unnecessarily)
4. inventory (producing more to protect against production problems)
5. process (unnecessary operations)
6. motion (excessive human activity)
7. defects (scrap, rework, salvage).

The aim is to achieve a smooth flow through the factory and between suppliers and customers. Hence, all activities which are non-value adding (when materials are not being transformed or added to in any way) are considered to be waste. Wilson et al (1995:p. 52) suggest that for a typical mass producer these forms of waste can amount to 200 per cent or more of direct labour costs.

Whereas operational efficiency focuses the attention of management on increasing the productivity of workers and machines at the time of transformation of materials, emphasis on process efficiency focuses attention on a series of activities that absorb much more time as the product travels through the entire process. "Workers can work twice as fast and still only increase throughput efficiency by minuscule amounts. Why? The amount of time that workers are actually transforming material is a small percentage of the total production time." The focus on Japanese systems is thus on increasing the overall human efficiency, as well as the overall machine efficiency. Best (1990:p. 149) argues that failure to understand this difference means a failure to understand the sources of uncompetitiveness in mass production.

This search to eliminate waste led to an attack on set up and carrying costs, which in turn lead to a reduction in batch size. This is said to be a significant innovation as it allows the firm to be more flexible and to improve quality. Under mass production, the 'economic order quantity' (EOQ), which is a measure of the optimum batch size in terms of cost, is determined by carrying costs (related to costs of inventory, labour and storage) and set up charges (time taken to set up, test samples etc). In mass production these are both considered to be fixed constraints, which meant that the larger the batch size, the more economical production would be. This results in production runs which, it is argued, are too large for today's markets (especially the small markets of the developing

countries), and which make it more difficult to control quality and creates long lead times (Wilson et al: 1995, p. 3). Kaplinsky (1994:p. 24) highlights that the objective in flexible manufacturing is to move towards a batch size of one, or 'single product flow'. Lot size is the number of units moving between work points, and is usually smaller than batch size. An objective of JIT is to reduce work-in-progress (WIP) and hence reduce to lot size to one in 'single unit flow production' (Kaplinsky, 1994:p. 24)[5]. "Production in every factory, it is believed, should be the same as that which occurs in a continuous flow process plant, or as if it were comprised of a moving production line irrespective of the variety of products being manufactured." (Kaplinsky, 1994:p. 24).

Other activities such as the wastes described above, also contribute to costs, but are not considered in the mass production accounting system. The continuous improvement firm focuses on reducing set up costs and other forms of waste, which can significantly contribute to competitiveness (Wilson et al, 1995:p. 3).

3.1.1 Just In Time and Single Minute Exchange of Dies:

Just In Time and Single Minute Exchange of Dies are two techniques which developed out of this search to reduce waste and are described briefly as examples[6].

Before the production of the first Toyota motor vehicle in 1937, Kiichiro Toyoda, the founder of the Toyota Motor Works, thought that the assembly line should be modelled after the American Supermarket. In this system, orders for replacement supplies are governed by sales off the shelf, at the last stage of the production system (Best, 1990:. 150). Together he and Ohno realised that inventories were wasteful because *firstly* they involved working capital which had it's own costs, and *secondly* because large inventories existed just-in-case anything went wrong without crippling plant operations (Kaplinsky, 1994:p. 20). *Large inventories and WIP thus hid the problems in production*. While mass production is seen as pushing products through the production system, JIT is a way of pulling them through (Best, 1990:. 150). The Kanban system was developed to pull work through the factory. The principle behind Kanban is that each workpoint draws stocks from the workstation before it by swapping an empty pallet for a full pallet of WIP. It was only when the

[5] work-in-progress or (WIP) refers to semi - manufactured products and components which are passed through the factory during the various stages of production (Kaplinsky, 1994:p. xx)
[6] For a detailed reading of these systems see Best (1990).

workers at the previous station received the empty pallet with the attached Kanban card that they resume production. If the pallet is not empty, then they should stop producing, instead of building up WIP. Thus, unlike mass production, if there are breakdowns or bottlenecks further down the line production should stop, and bottlenecks targeted for improvement (Kaplinsky, 1994:p. 20).

Another innovation of Toyota's was to focus on Single Minute Exchange of Dies (SMED) for Economic Order Quantities and a focus on fast change overs and set up times. (Huge & Anderson, 1988:p. 11, and Best, 1990:p. 150). This idea was proposed by Shigeo Shingo from the Japan Management Association (Best, 1990). According to Best:

"JIT in a multiple product plant without flexible production methods is no different from mass production. In both cases the assemblers seek to cut costs by having suppliers hold inventories and deliver as needed. What makes JIT revolutionary is the capacity of production facilities to produce a range of products economically with short changeover times." (Best, 1990:p. 150).

Long production runs are a feature of mass production since die[7] changing took many hours to do, and hence it was more economical to keep production running than to stop for changeover. In order to increase product diversity, mass producers invested in more capital equipment to avoid changing dies. (Best, 1990:p. 152). Ohno was constrained by a capital cost budget and needed the entire car to be stamped from a few press lines. Energy was thus focused on simplifying die change over techniques in order to be able to change dies more frequently. In the 1940's Ohno purchased used presses from America and experimented with the technique until by the late 1950's the time required to change over had been reduced from one day to three minutes. Further, in mass production, die changing techniques are complicated and specialist teams were employed to change dies. The new simplified techniques meant that workers could now change dies (Womack, Jones & Roos (1990, p. 53).

Womack, Jones & Roos (1990) suggest that as a result of these experiments it was discovered that it actually cost less per part to make small batches of stampings than to make long runs. Two reasons for this are offered; first, less capital is tied up in inventories and second quality faults were picked up

[7] A die is like a mould, or punch and is used to stamp out the shape of the produce e.g. automobile body parts

sooner. Hence, focusing on fast change overs and set up times results in synchronising production with usage and quick feed back loops (Huge & Anderson, 1988:p. 11).

"Thus JIT depends upon, and is a consequence of, flexible production based on short runs and changeover times. Otherwise, JIT would simply mean pushing inventories upstream to suppliers." (Best, 1990:p. 153).

3.1.2 Self - working technology & preventative maintenance:

Other examples of innovations arising from continuous improvement at Toyota, are self-working technology, and preventative maintenance. Self-working technology refers to machines which are designed to "watch over production" using built in sensors which could detect variations or abnormalities in production and switch themselves off. "For Toyota, automation meant machines with a built-in capacity to stop." (Best, 1990:p. 153). This innovation decreases waste and hence increases efficiency. Also, workers no longer needed to be machine minders which had a dual impact. *Firstly*, workers were able to engage in problem solving to improve the production process, quality and to carry out preventative maintenance to stop machine breakdowns[8] (Best, 1990:p. 154). *Secondly*, machine layout could be changed from a straight line layout to a U shape. This later resulted in the system of cellular production. Here, instead of machines being laid out functionally (i.e. having all cutting machines in one area), a defined set of products or components could be produced in one cell. This, it is argued, gives operators a better overall perspective of the entire process, enables them to take increased responsibility for the job, and makes them more responsive to customer needs. The approach also requires that operators be multi-tasked and multi-skilled[9].

"Increasingly the task of workers shifted from being mere operators of a single machine to maintaining machines and seeking process modifications so that machines would not shut down. Thus workers became problem solvers as opposed to merely machine minders." (Best, 1990:p. 154).

3.2 Elimination of uncertainty in the production process - Statistical Process Control:

The second innovative principle underpinning JMT's is the approach to scientific management.

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[8] The package developed for preventative maintenance is called Total Preventative Maintenance or TPM.

[9] There is a distinction between multi - tasking and multi - skilling. A multi - tasked operator can perform a number of different horizontal operations. The multi - skilled operator is one who can perform a number of different vertical functions e.g. data collection, preventative maintenance and machine operation.

Instead of adopting Taylorism, the Japanese followed the principles of W. Edward Deming who championed statistical quality control (SQC)[10].

According to Best (1990:p. 158) the two systems have totally different foundation principles. The purpose of Taylorist information is to minimise direct labour costs in the production of a standardised product, while for Deming the point of information was to provide a basis for continuous upgrading of production.

The aims of Statistical Process Control (SPC) are two-fold. *Firstly*, to achieve quality at source and prevent rework and *secondly* to bring the system 'under control' and create normalisation. Proponents argue that statistical controls highlight the *systemic causes* of problems and make it less easy for management to blame workers for defective parts. This view has been challenged, and SPC has been referred to as "Management by Blame". This is discussed later in the chapter where it is highlighted that the nature of the use of SPC could depend much on the motivations for it's introduction. Here I explain the principles which underlie the system when applied to bringing production under control.

The three main principles of SPC are *firstly* that defective products are usually caused by poor systems and not workers, *secondly* that systems are thus needed for identifying problems, not disciplining workers, and *lastly* that improved quality leads to lower cost because there is "less rework, fewer mistakes, fewer delays and snags, and better use of machines and materials"[11] (Best, 1990:p. 160).

[10] The originator of SQC was Shewart, Deming's mentor, who wrote a book entitled "The Economic Control of Quality of Manufactured Product" in 1931. Deming was in Japan in 1947 to work as a statistical sampling advisor to help with the Japanese 1951 census. In 1950, the Japanese Union of Scientists and Engineers (JUSE) invited Deming to give a series of lectures on SQC. Deming agreed on condition that top management were introduced to the concepts as he was aware that changes in work organisation were not possible without the commitment of top management. The JUSE arranged the meetings and the methods came to be adopted in much of Japanese industry. (Best, 1990:p. 159).

[11] Womack et al (1990, p. 57) highlight that in the Toyota assembly plants there is practically no rework, whereas in typical mass production plant 20 % of the plant area and 25% of total labour effort is directed to fixing mistakes.

3.2.1 Bringing the system under control:

Variations and fluctuations in production are indicators that problems exist. SPC is one way of seeing the variations and fluctuations so that problem identification can happen for root cause problem solving to take place. According to Mr Furuhashi (BPI workshop Jan '96) if the people do not understand fluctuations as problems, the company cannot apply problem-solving.

The problem with variations and fluctuations are that when they are large or unpredictable, the firms ability to predict future outcomes and to plan ahead is undermined. Variations also end up pushing up costs and lead to customer dissatisfaction (Wilson et al, 1995:p. 9). SPC is used to determine the extent of the variations. When the variation between the actual and the desired outcome is significant, serious problems occur. A reduction in statistical variation leads to cost savings which may escape the traditional financial accountant, such as fewer inspections, less rework and better quality (Wilson et al, 1995:p. 9).

The interaction between materials, machinery and people is the source of variation which in the CI firm must be brought under control ('normalisation) before a firm can introduce improvements in production. This is because by creating 'normalisation' the causes of the problems will become apparent.

Wilson et al (1995:p. 9) describe two different causes of variation, *common - cause variation* and *special cause variation*. *Common cause* variations occur due to flaws in the production system and unless improvements are made to the manufacturing system the problems will persist. *Special causes* of variation occur intermittently, at isolated times or locations. Special causes may be attributed to worker behaviour, operating procedures or variations in the equipment or materials, and are beyond the firms usual experience (Wilson et al, 1995:p. 9/82). When a system has both common and special causes of variation it is unpredictable and is said to be 'out of control'. Eliminating the special causes of variation should be the first step to normalise the system or bring it back 'in control' (subject only to common causes of variation). Wilson et al highlight that the actual process of CI can not begin until the system is 'in control'. This distinction between the causes of variation is important since the tendency to confuse them, or not to recognise the distinction, often leaves little

clues as to where the **root causes** of the problems are (Wilson et al, 1995:p. 83). Often, common causes are mistaken for special causes and as such the problems will never be solved.

Common tools used to identify sources of variation are process flow charts, check sheets, Pareto diagrams, cause-and-effect diagrams and histograms (for a detailed discussion on each of these tools see Wilson et al, 1995:p. 85 - 100)[12]. These are the basis of the data gathering methods used in SPC. Once the initial investigations have been done, the patterns of variation can be monitored by constructing control charts. They help in identifying the different patterns of variation, learning more about the underlying causes of variation, and act as a means of measuring the success of improvement efforts (Wilson et al, 1995:p. 96). The use of SPC should be more substantial in the early phases of CI implementation with firms eventually moving beyond these basic elements of process control. For some firms the charts and diagrams common to SPC become a permanent feature (Wilson et al, 1995:p. 100).

5S and visual management (described in detail as part of the field research in Chapter Four[13]) are shopfloor methods used to achieve reliable and consistent production i.e. normalised production[14]. 5S and visual management focus on removing the special causes of variation and is therefor a system developed to help prepare the groundwork for continuous improvement. *This is why 5S and visual management are considered to be the basic and common ingredient for any kaizen capsule or improvement package* (Mr Furuhashi, BPI Workshop, Jan '96).

The idea of bringing the production process under control in order to root out the causes of problems forms the basis for continuous improvement. This is one of the key principles which constitutes the shift in understanding problems in production.

[12] See Appendix Three for a problem solving sheet used in a SA'n company
[13] The focus of the BPI workshops was on the 5S system incorporating visual management for control of operations.
[14] "The removal of special causes, although crucial, does not represent a genuine improvement in the manufacturing process. For example, variation in a product might be caused by the haphazard way tools are arranged and located on an assembly line. Once it is agreed to place the tools in exactly the same way all the time, the variation due to operators fumbling for tools is eliminated. A special cause of variation has been eliminated; when all other special causes are eliminated, the process is in statistical control. Only at this point can the critical work on systemic causes for continuous improvement actually begin." (Wilson et al, 1995:p. 100 note 5.).

3.3 The principle of Continuous Improvement and the learning firm:

The third key principle central to the changing efficiency paradigm is the principle of the learning firm. Through the use of tools and shared information, the firms and the people in them, can 'learn by doing'. "Mobilising and managing knowledge becomes a primary task and many of the recipes offered for achieving this depend upon mobilising a much higher level of participation in innovative problem-solving and on building such routines into the fabric of organisational life" (Bessant & Caffyn, 1996:p. 3). In terms of production, the concept of a learning firm basically implies that any changes in production are recorded, measured and officially implemented as new Standard Operating Procedures (SOP) are drawn up.

It is as a result of capturing the learning that innovation occurs; "There is now substantial evidence to support the view that innovation matters as a key strategic resource. Organisations which are able to renew their products and services and the processes whereby they create these have distinctive and defensible competitive advantages." (Hamel and Prahald, 1994; Kay, 1993 in Bessant & Caffyn (1996:p. 4). But most innovation is not of the 'breakthrough' variety; it is much more a process of systematic elaboration and development of original ideas." (Bessant & Caffyn, 1996:p. 4). Innovation varies greatly by industry, technology, cost, novelty, and by type (product, process, organisation or system) (Freeman, 1994:p. 474).

A distinction is also made in the literature between incremental (or minor) and radical or (major) innovations (Stobaugh, 1988 in Freeman, 1994:p. 474). This dichotomy Freeman says is important because the two different kinds of innovation require a different mixture of knowledge inputs (Utterback, 1993 in Freeman, 1994:p. 474). Freeman cites two studies conducted in industry (Hollander, 1964 and Townsend, 1976) which found that most innovations did not come from R&D (even in firms with large R&D departments[15]). Rather, "most of the hundreds of small improvements to the equipment and the organisation of work came from production engineers, systems, engineers, technicians, managers, maintenance personnel and of course from production workers." (Freeman, 1994:p. 474).

[15] when it came to discontinuous change in product or process, which requires knowledge which goes beyond the experiences of the people involved in production, then R&D departments play a central role.

Best (1990:p. 166) describes the firm as "a learning organization that is continuously creating new productive services by teamwork and experience". This is one aspect of the entrepreneurial firm in Bests conception. For him the entrepreneurial firm is:

- Schumpetarian in that it chooses the terrain of the competition and thereby competes strategically (competing on the basis of product, price, quality, technological process, or product innovation

- Penrosian in the sense that it is a learning organisation, which through team work and people with experience in the firm is continuously creating new productive services.

- Richardsonian in that inter-firm relations can be co-operative or market oriented.

3.3.1 Implementation of Continuous Improvement in firms:

Bessant (1996) defines Continuous Improvement as efforts to increase participation from all employees in problem solving and in the innovation process within the organisation. Best adds that the New Competition, "... is not about maximizing profits for a given material, product, process, and organizational method, but about seeking a competitive advantage by continuously upgrading product, process and organization. The New Competitor is a business organization that pursues a strategy of continuous improvement by integrating thinking and doing." (Best, 1990:p. 144).

Literature on the implementation of CI in firms (Wilson, Balance & Pogàny (1995) ; Bessant (1996)) highlights that the adoption of continuous improvement in a firm is a process which takes place in stages. Firms will usually begin with tools which help with the normalisation of operations and firms should progress to using different tools and techniques at different stages as they move further along the CI path. This means that the changes involved in the adoption of JMT's may not all take place in one fell swoop, but could take place gradually. Many firms do not progress beyond the first phase of implementation and reasons for failure need to be examined. Mr Furuhashi warns that firms attempting to introduce too many new programs at once could suffer from "indigestion".

Bessant & Caffyn (1996) discuss the stages of adoption of CI in companies, and it becomes clear from this that implementation is not easy. Since CI is based on daily and incremental improvements, companies should not expect dramatic short term results, and should adopt a long term view to improvement. In many instances the failure to achieve short term results leads firms to look for the

next solution, instead of persevering. Further, the tools themselves can not necessarily be bought off the shelf and installed. They too must be adapted to the specific circumstances and requirements of the production activities in the firm. Each company has it's own 'character' and set of circumstances and as such it is unlikely that programmes can simply be copied, and companies will adapt programmes to their own needs through practising and capturing the learning (Bessant & Caffyn, 1996). These factors then point against the rapid diffusion scenario which assumes that the techniques are easy to introduce. As the firm successfully implements various tools it is likely to progress along its own technological path (Wilson et al, 1995:p. 7). Wilson et al (1995) provide the example of the development of JIT methods of inventory control; "Many observers hailed this achievement as a 'revolutionary breakthrough', though in reality it was the outcome of 30 years of evolutionary, incremental improvements (see Nayak & Ketteringham (1986) in Wilson et al, 1995:p. 45; Kaplinsky, 1995:p. 59).

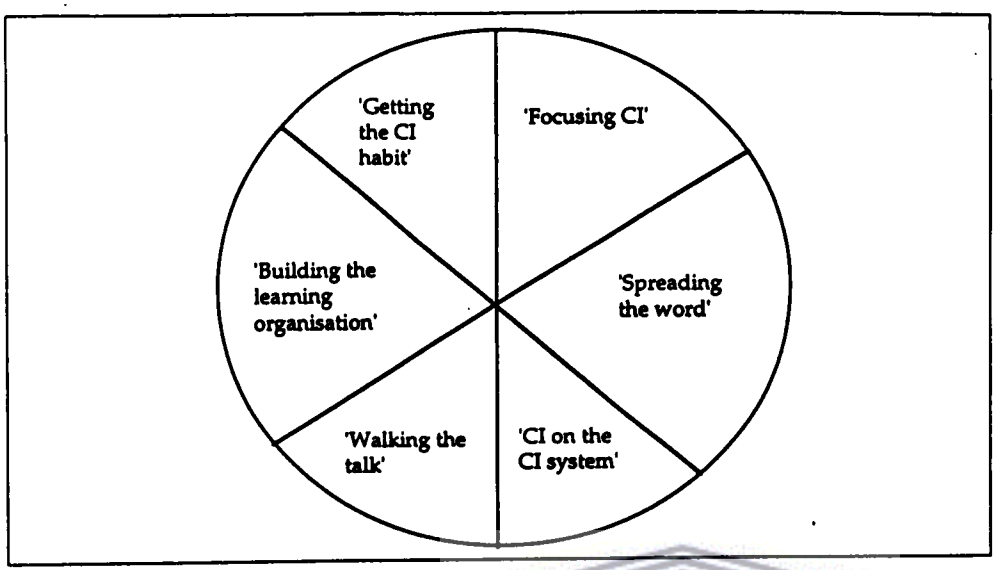
Bessant & Caffyn (1996) argue that companies learn by doing. Through research they have identified common stages of the development of CI in a company[16]. They argue that CI is essentially achieved as the organisation, and the people in it, learn patterns and routines which, through practice, become habit. As the routines become internalised, so they become part of 'the way we do things around here' - in other words, part of the dominant culture of the organisation.". In this way high levels of involvement can be sustained. Learning begins by mastering the lower level skills, gradually becoming more advanced and later beginning to experiment (1996:p. 7). Training in the philosophy and background to CI is probably only likely to become entrenched if it is supported by actual practices on the ground.

[16] The categories in the Continuous Improvement Process Model are described in Appendix Four. Here tables depicting the stages in the evolution of CI capability, and enablers for successful implementation from Bessant & Caffyn (1996) are presented.

Figure 1

Continuous Improvement Process Model

Bessant & Caffyn (1996:p. 11)



In this development path, the organisation moves from acquiring the CI habit to developing a full-scale learning organisation. New ways of behaviour and paradigm shifts are likely to occur through learning by doing (Bessant & Caffyn, 1996:p. 10). Many companies fail to master the use of tools and techniques and don't get to the stage where an integrated programme is put together. The need to relaunch or kick- start programs to help sustain interest is highlighted by these researchers, as well as by Mr Furuhashi.

4. Other features of the Japanese Production System:

There are a number of other features of the Japanese system which are not directly related to production techniques but which are still relevant for the discussion of diffusion. These are the organisational structure of networking, internal and external customer focus, new product development and supply chain management. As they do not directly pertain to production techniques, the discussion here will be brief.

4.1 Hierarchy vs. Networking:

Traditional mass production organisations are organised according to functional divisions and hierarchies. Organisational structure is often conceptualised as a pyramid with management on top

and shopfloor at the base. In the Japanese plant the organisation is seen as a network of supporting functions, and this often involves the establishment of cross functional teams (e.g. Jishuken teams and quality control circles). According to Wilson et al (1995:p. 13) the hierarchical structure of the traditional mass production firm, together with the degree of job specialisation, inhibits the efficient flow of information in the organisation which impairs decision making, especially the flow of informal information from the shopfloor. Informal information is described by Wilson et al (1995:p. 13) as data derived from the experiences of production-line workers and pertains to the use of materials, components, machinery and the manufacturing process of the firm. Formal information collected by most firms is more quantitative in nature.

4.2 Internal & external customer focus:

One of the key organising principles in the CI firm is the understanding that the customer is not only external to the organisation, but there are also customers within the production process i.e. each step in production is the customer of the one before it. "The satisfaction of each customer, whether internal or external, is the concern of every group." (Wilson et al, 1995:p. 49). Hence, divisions between departments are broken down in the Continuous Improvement Firm in order to encourage collaboration between customers and suppliers within the firm.

4.3 New product development:

Best (1990:p. 155) argues that in terms of new product development companies which have a multi-divisional organisational structure can not compete with the New Competition. Because product development is done sequentially by functionally specialised departments, the lead time becomes too long. Management's function is to co-ordinate across departments and the departments do not co-operate in the different stages. This makes new product development very cumbersome and difficult as each stage has to sort out the problems not considered by the stage before. In the Japanese system, product development teams are cross-functional comprising product designers, process engineers, manufacturing and marketing personnel. In this way "the phases of product design, development, and commercialisation are overlapped so that problems are being tackled simultaneously." (Best, 1990:p. 156). Product development is thus a much more integrated process and allows for shorter development cycle times, increasing flexibility and market responsiveness.

4.4 Supply chain management:

While this aspect is not in the ambit of Production Strategy per se and hence does not directly relate to the case study, it is nevertheless a central feature of the Japanese Manufacturing System and is thus introduced.

Whereas mass production firms tended towards vertical integration of supply chains, the Japanese system evolved into a system of supplier networks organised into functional tiers. Mass production firms tend towards vertical integration and varying degrees of integration were achieved in the mass, with 25 % in-house production at firms such as SAAB, and as much as 70% in General Motors. Decisions focused on whether to make or buy and competition amongst suppliers was based on price (Womack et al (1990, p. 58). Blue prints were typically designed by the firms engineers and then put out to tender. Business relations were often seen as short term and it was "every firm for itself" when downturns in demand occurred.

The Japanese decentralised supplier networks starting in the 1970's at the same time as they began pursuing product led strategies, and demands placed on suppliers focused increasingly on quality and on time delivery as opposed to price. Parent companies established Kyoryokukai - formal associations of co-operative parts makers - with the aim of increasing the capabilities of suppliers. Small and medium sized firms in Japan accounted for 99.4 percent of all manufacturing establishments in 1982 (Best, 1990:p. 161). Womack et al (1990, p. 59) suggest that Ohno identified many problems with the traditional supplier relations in mass production;

- since the lead firm supplied blueprints to suppliers and did not pass on information regarding the design of the vehicle, suppliers had little opportunity or incentive to make improvements to the product design based on their own experience.
- the assembler also knew little of the suppliers manufacturing techniques and hence could not control quality besides imposing maximum acceptable level of defects.
- co-ordinating the flow of parts in the supply chain on a daily basis was also seen as problematic, and the erratic nature of demand from the lead firm caused suppliers to build large inventories, often of defected goods.

In response to this Toyota organised the suppliers into tiers and different responsibilities were assigned to each tier, and firms within the same tier collaborated with one another (Womack et al

(1990, p. 60). This system of tiered supplier relations fits in with a strategy of innovation as it would be difficult for a large vertically integrated firm to stay ahead of technological developments. "... the effect has been to increase the capacity of the Japanese auto industry to compete on the basis of product innovation because it has increased the independent design capabilities of parts makers." (Best, 1990:p. 164).

While some argue that this system embodied a high dependency ratio of supplier firms to parent firms, firms were encouraged to perform work for other lead companies. Each supplier is thus an independent company and operates as a separate business unit or profit centre. Personnel are also shared between parent company and suppliers, with managers often being moved to supplier firms when there is no place for promotion within the parent firm (Womack et al (1990 :p. 61).

Having expounded on the features which it is claimed underlie the competitiveness of Japanese firms, it is important to raise the issue of company strategy. The significance of aligning the use of manufacturing techniques with the company's overall competitive strategy is discussed below.

5. Aligning the technique with company strategy:

While JMT's may be the best way to meet "The new competition", the importance of choosing a technique according to the company strategy must be highlighted. I argue that the adoption of JMT's should not be considered a goal in itself, but needs to be linked to the company's overall competitive strategy.

Best (1990) highlights that in Mass Production *strategy* usually referred to marketing, and the only *strategy* for production was to keep prices low. In the Japanese firm, strategic choices were made in the realm of production. Mass production thus has price led competitive strategies, whereas Japanese Production has a product led strategy depending on quality, organisational flexibility and or product innovation. Haynes and Wheelwright (1984:p.40 in Fleury, 1995:p. 75) describe five ways to compete; price, quality, dependability, flexibility and product innovation, and they argue that "[O]nly when one strategy is clear can the alignment of organizational functions become viable."

(Fleury, 1995:p. 75). It is thus critical that firms intending to adopt JMT's do not see them as a panacea, but rather as supporting their strategic choice[17].

The Lean Production or Japanese model of production is but one competing model of productive efficiency and, as Mathews (1994) highlights, the firm is likely to choose whichever model is best suited to their production strategy. He argues that a firm will employ a lean production model if "... it is seeking to compete in a rapidly changing market where success goes to speed of innovation, market responsiveness and quality of product rather than low price." (Mathews, 1994:p. 44). However, if a firm is competing in a mass market for low quality, low price goods, this might not be the optimal strategy to follow. This is a crucial understanding.

Mr Furuhashi (BPI Workshop, Jan '96) emphasised the need to attach the technique to the strategic purpose of the company; *"it cannot"*, he says, *"have goals of its own, it cannot become an end in itself"*. As Fleury (1995b: p. 75) points out that the systemic and strategic approach of Ford has been ignored especially in the West, during the process of the diffusion of mass production.

It seems that the potential exists for the same to happen with the principles of production developed in Toyota and firms will find that "the emperor has no clothes". Fleury (1995:p. 73) suggests that Ford understood the market requirements of a cheap car for the public, and developed a production system which matched the resources available to him - and Toyota did the same. The competitive strategy which they chose needed a production system which could deliver efficient small batch production (Fleury, 1995:p. 74).[18], [19]

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[17] Similarly, Meyer - Stamer (1995) also highlights that if firms are to be competitive, they should meet all four of the following criteria; efficiency, quality, flexibility and responsiveness. Efficiency refers to maximum capacity and labour utilisation, keeping costs down through reducing waste. Buyers expect quality goods and often buyers demand that firms meet the ISO 9000 quality standard system. Flexibility refers to a firms ability to deal with market volatility and differentiation. Firms should be flexible in a number of areas; product flexibility (changing easily between products), volume flexibility (ability to handle changes in volume efficiency), routing flexibility (the ability to process parts via different routes in the factory in response to unseen factors), machine flexibility (being able to make different parts within a product family), operation flexibility (ability to vary the sequence of operations), and process flexibility (the ability to produce a product family in different ways , perhaps using different materials). Responsiveness refers to the speed of the innovation process within firms (Meyer - Stamer, 19905:p. 144).

[18] For a detailed discussion of the relationship between manufacturing capability and manufacturing strategy see Haynes & Pisano (1994)

[19] For an example of how a flexible manufacturing system was inappropriately used for high - volume, standardised production see Jaikumar, 1986:p. 69, "In short, they mastered narrow - purpose production on expensive FMS technology designed for high - powered, flexible usage." The lesson is that it is not technology itself which can bring competitiveness, but how it is used.

It is thus critical that the choice of production technique be linked to production strategy, which in turn should be aligned to the overall company strategy.

In this section I have highlighted the forces which have contributed to the ascendancy of Japanese Manufacturers. I have argued that unless the firm has strategically determined its terrain of competition, the employment of JMT's for their own sake will reap little long term benefit, and that JMT's may not necessarily be the production system for all firms. Both of these points indicate that the process of diffusion is not likely to be rapid and widespread.

5.1 The validity of claims regarding the effectiveness of JMT's:

Some argue that the JMT's do provide sufficient conditions for sustained manufacturing, and point to the recent manufacturing declines in Japan as evidence. Saturated markets, export competition, the appreciated Yen and general slowdown following the big catch up have contributed to this decline, and work organisation has not been enough to sustain the economy (Williams et al, 1992 ; Lloyd, 1994). This is an important point as work organisation should be seen as a necessary, yet not a sufficient condition for competitiveness. Further, there probably is a limit to the trajectory of growth and Kaizen which a firm can achieve.

There is limited literature which challenges the notion of the efficiency of the Japanese production systems. Williams et al (1992) have written a comprehensive critique of the research of the International Motor Vehicle Project (IMVP) and the resulting book "The Machine that Changed the World" by the proponents of Lean Production. They offer a revisionist perspective of Lean Production arguing that it is not actually that much more efficient than mass production and that the calculations conducted by the IMVP are misleading[20]. They question the Womack et al (1990) proposal that Lean Production is superior to mass production and should be adopted by manufacturing concerns the world over, and argue that Toyota stands out as an exceptional example amongst Japanese firms.

It seems however, that while they may have pointed out some methodological weaknesses in the IMVP research programme, they did not disprove the efficiency of the Japanese system. This is

[20] Space does not permit a detailed account of the Williams et al critique, and only a few examples are raised here.

because they attempted to analyse the Japanese system using traditional forms of calculation. This seems to be apparent throughout the article when they talk about labour input hours, measurements of capacity utilisation and so on. They acknowledge this themselves when they say that the Japanese car firms ability to take the labour out of the product, lies in a different form of management calculation "especially the preoccupation with the direct physical measurement within a culture of Kaizen." (Williams et al, 1992:p. 343). They do suggest that the competitiveness may *not* be found in traditional means of evaluating and accounting for productivity and growth. In a latter article, Williams, Mitsui and Haslam (1994:p 76) argue in fact that effective Japanisation would mean Western firms demoting the finance function and learning radically new forms of calculation[21]. Their conclusion in this later article is that "... effective Japanization would require changes in forms of calculation, a new management cadre and a level of workforce commitment which is probably neither possible nor desirable in the West. In fundamental respects, Western management is very far from Japan." (Williams et al, 1994:p. 61).

The basic argument of Williams et al (1992) is that the source of competitiveness in Japanese manufacturing can not be attributed to system characteristics. Central to their critique is that the IMVP researchers failed to take manufacturability and capacity utilisation into account as variables influencing process comparisons. From a careful reading of their article however it becomes apparent that in their attempts to deny system characteristics they miss the very source of Japanese competitiveness. For instance, they attempt to focus their critique on the cost of car production, rather than on quality, non-price competition and other areas of manufacture such as design and development (Williams et al, 1992:p. 324). Thus, while they attempt to argue that Womack et al (1990) failed to take manufacturability into account, they also ignore the ease of manufacture of Japanese cars as a key result of the product development process, which is a system characteristic.

A valid point of criticism made by Williams et al (1992) is that Womack et al (1990) ignore the benefits which operating in a system of supplier networks gives to final assemblers. They argue that the proponents of Lean Production fail to acknowledge that small firms in Japan (less than 100 employees) paid lower wages than the large firms, wages which were equal to 53% of the largest firms. Thus, they argue that the vertical disintegration of Japanese industry gives it a specific advantage by using low wage suppliers. "... the point is that the Japanese motor industry depends

[21] This, they argue, is almost impossible to conceive happening when financial expertise is often an important qualification for senior management.

heavily on small supplier firms which cover their conversion inefficiency by paying lower wages." [22](1992:p. 346).

William's et al (1992) raise an interesting point regarding the causal relations of cross process comparisons and the variables used by Womack et al (1990). In terms of the three variables of team work, visual control of production and low absenteeism, Williams et al (1992) question the nature of their independence, as these characteristics are generally present in Japan and not elsewhere. "Their 'independent' status is very dubious if the plants with low assembly labour hours are also Japanese. In this case the result will be a respectable positive correlation which tells us nothing about causal relations because the work is only exploring an identity with Japan redefined in different ways on either side of the correlation. The propensity of the workforce to eat raw fish and read comic books or any other set of peculiarly Japanese characteristics would produce an equally impressive positive correlation and of course imply nothing about the causes of low assembly labour hours." (Williams et al, 1992:p. 339). This then points to the embeddedness of the techniques which would interfere with the process of diffusion.

From a careful reading of Williams et al (1992) it seems that the system of Japanese management can not be critiqued from within the traditional conceptions of Western Production management, and evidence does point towards an efficient production system. In this sense the Japanese system represents a significant paradigm shift. There are however certain continuities between Mass Production and Lean Production, particularly with regard to the implications for labour. It is also important to bear in mind that mass producers adopting Japanese Management Techniques will be undergoing a transformation, and that hybrid forms are likely to emerge. The empirical distinction between mass production and lean production seems to be an analytical one. Ewert (p: 3) has argued that it is more realistic to talk of hybrid forms, what he terms "Neo-Fordism". This is one way of describing the continuities which exist between the changing paradigms. Woods argues that talking about a new paradigm is misleading as "... at worst [the flexibility writings] were based on a

[22] Mathews (1994:p. 36) also raises this issue and highlights that pressure is being applied to final assemblers by MITI to take on more of the costs themselves, rather than externalising them through sub - contracting. Other elements of the Lean Production System are also being criticised in Japan for having high social costs, such as the large amount of small delivery vehicles clogging up the roads. Mathews states that the "MITI- favoured automotive producer" is now Mazda, not Toyota, which still adheres to strictly to the principles of LP, but Mazda is making efforts to internalise many of the social costs created by LP.

misconceived conceptual foundation that was rooted in a false dichotomy between Fordism and Flexibility, little or no robust supporting evidence and a romanticised conception of the empowerment open to workers within capitalism." (in Ewert, 199?: p. 4). This point is debated in detail below.

6. Paradigm shift for labour?

It is often argued that the Japanese Manufacturing System result in an improved quality of work life for workers as they "... represent a rethinking of the fundamentals of human creative activity, motivation and aspiration." (Mathews, 1994:p. 11/ 12) The problem is no longer seen as inefficient workers, but inefficient structures and systems which need to be re-engineered to release the productivity and creativity that is constrained by the traditional structures. This view has been challenged in much of the literature. My position is that while the principles of productive efficiency of the Japanese system do seem to make competitive sense, this does not mean that the quality of workers lives is necessarily improved. The nature of work itself remains highly routinised, and while there is some opportunity for workers to receive additional training and to participate in problem solving, the nature and degree of the participation is limited, and is dependent on the degree to which the systems are systemically employed by the company. Further, Japanese manufacturers operate within a system of supplier networks with better conditions of employment for core workers. The system could thus only operate to the benefit of those with secure employment in the core enterprises.

The implication of these factors for mass manufacturers undergoing transformation is that employing the techniques themselves is not necessarily going to deliver the commitment needed to operate the system at the required levels of efficiency, as conflicts in production are likely to remain. It is critical that this issue be raised, as often the perspective offered by those from within the engineering profession is that if you take care of the process the rest will follow. People as independent agents have thus been left out of the debate. My contribution here is to reintegrate the social discussion with the technical.

6.1 Implications for labour:

In the section below I raise the critiques of Japanese Production management in terms of the implications for labour. I argue that the Japanese system should not be considered to be inherently beneficial for workers and does not necessarily represent a reintegration of mental and manual labour. Work remains highly routinised and as the system is fragile leaves little room for workers to control their own pace of work. It seems that in order to maintain a commitment to operating the system at the required levels of efficiency, supportive human resource factors, like appropriate rewards and participative management, need to be employed. It may thus be that if Japanese techniques are employed in other countries, and are not applied systemically (e.g. leaving out team work), then it may prove difficult to sustain the change programmes. I argue thus that one should treat with caution the arguments that Japanese Production Systems necessarily improve working lives and much depends on the approach of management in the implementing plant.

6.1.1 Workers are subsumed to the system:

Mathews argues that the limit of Lean Production is that it subsumes the human to the system. He argues that Lean Production has "overturned the Taylorist canons of productive efficiency erected by the MPS[23] in firms seeking diversity and quality of output. But in their place, it has established a new and potentially dangerous orthodoxy, namely that the system is more important than its component parts." (Mathews, 1994:p. 35). This, he argues, is because the lean production system is so fragile, based on "razor-sharp Just-In-Time principles, that the slightest variation could cause the system to seize.

Since the system is so tight, or fragile, with few buffer stocks and low WIP between stations, requiring the smooth flow of information between work stations, it leaves little room for workers to control their own pace of work. In the factory where Delbridge conducted his research "[E]very individual role is standardized and fragmented to a tenth of a second." (Delbridge, 1995:p. 811). Further, since activities are governed by the next customer in the supply chain, workers are in effect subsumed to the system. "... the system dictates to each individual what to do and when. For workers at the plant, this has a physical manifestation in the conveyor belt at which they sit. Worker choice is severely restricted and the alignment of management's requirements of labour with

[23] MPS stands for the Mass Production System

economic objectives[24] reduces the workers' opportunities for establishing customs or practices which limit the intensity of work and the completeness of management control." (Delbridge, 1995:p. 809).

Kaizen has thus also been called high-tech Taylorism; as workers are forced to rigidly adhere to the Best Operating Practice, and as the production process becomes increasingly smoother, so there is less opportunity for improvement suggestions, and work becomes highly repetitive (Lloyd, 1994:p. 8)[25]. Workers on Japanese assembly lines still perform short-cycle repetitive tasks which can be completed in less than one minute. Wilkinson et al (1995 p. 827) also highlight that the Japanese companies studied still base their operations on production line principles, focus on work cycle times, and detailed job measurements and this, they argue, suggests continuity with Taylorist principles. (see also Dohse (1990); Berggren (1992) (in Mathews, 1994:p. 35) & Dohse et al (in Elger & Smith, 1994:p. 8)

In the absence of improvement teams, where workers themselves are involved in identifying and improving their own production, the Japanese System seems to be no more enriching than the scientific management of Taylorism. For example, in research conducted by in Wales by Wilkinson et al (1995), of the 22 Japanese manufacturing facilities studied, only five had Kaizen teams, and eleven had quality circles.

From the discussion above it seems that while the production principles may be different between the two systems, in many ways the physical manifestations for labour remain much the same.

6.1.2 Management by Stress/ Intensification of work:

It is in the light of the factors above that Kaizen has been referred to as **'Management by Stress'**. In fact, it is proposed by Lloyd (1994:p. 7) that stress is one of the key factors which drives Kaizen. Lloyd (1994) argues that as waste and excesses are removed (including excess labour), the production system is made fragile and is run until it breaks down. At the point of breakdown,

[24] By this Delbridge means that the illusion of a market environment is created in the firm as a result of the internal customer orientation.

[25] Best Operating Practice is the same as a Standard Operating Practice, but in the context of Continuous Improvement no procedure is fixed and it can only considered to be a current best practice until improvements are made, and the procedure changed.

workers suggest ways to redesign the system in order to cope with the pressure of work intensification. This is supported by Rinehart et al's (1994:p. 163) observations in a Japanese joint venture auto firm in Canada. They found that under immense time pressure a team had designed ways to share the jobs between themselves and created a floater position to carry out off-line duties. This was accepted by management, but when the researchers returned to the plant a few months later, the floater had been removed by management, leaving the rest of the team with intensified jobs. This plant was however unionised and the workers exercised their right to refuse unsafe work, and eventually the floater was returned to the team (Rinehart, Robertson, Wareham, 1994:p. 164).

Multi-skilling and cellular layout is considered to be intensification of work to an unacceptable degree. This is one sense in which ***kaizen*** is built into the system of production, and accounts for the characterization of JIT as 'management-by-stress' (Slaughter, 1987)."[26]. (For further reading see also Wilkinson et al ,1995:p. 822 for case study examples of management by stress).

6.1.3 Reintegration of mental and manual labour?

In a similar vein, Graham (1994) argues that the process of continuous improvement does not constitute a change in the way that workers are thinking more in production, or a reintegration of mental and manual labour. Rather, it is argued, that workers have always found ways to make their jobs easier, or to buy themselves some time. According to Graham, the distinction with kaizen is that management is now appropriating this knowledge (what could also be referred to, in other terms, as firm level learning.). Graham (1994) conducted ethnographic research in a Japanese auto plant in the USA and worked undercover on the line for 6 months. According to her experience, when workers found a way to create some spare time, what Burawoy calls 'Making Out', they ran the risk of having the job intensified, what workers in the plant referred to as "kaizening". She argues that "Kaizening is not only designed to capture worker's secrets for gaining spare time, once management appropriates that knowledge, it controls when, where and how these ideas are implemented. Kaizening, therefore, is an extremely effective procedure. It essentially convolutes the making out process, which under other management systems benefits the worker, into a process that puts continuous stress on the worker and forces workers' compliance." (Graham, 1994:p. 138).

[26] For another case study describing management by stress in an American plant see Rinehart, Robertson, & Wareham, 1994:p. 164.

In a study conducted in an a Japanese joint venture auto firm in Canada, researchers asked the workers in the sample what best described the companies efforts at reducing waste and increasing efficiency. 61 per cent chose 'working harder' over 'working smarter' and 92 per cent said ' a more demanding' rather than 'a more comfortable' workplace. (Rinehart et al, 1994:p. 169). The researchers conclude that the work practices at the plant allow for limited use of conceptualisation, and that without opportunities for continuous training, learning and skills development, together with a hierarchical control apparatus, there has been no movement towards the reintegration of mental and manual labour at the plant. The Canadian Automobile Workers union newsletter warned their membership:

> *"... to be wary of how easy it is for management to fill up the time we save with our improvements. This sort of continuous redistribution of work costs us jobs, and eventually puts such a burden on us that we risk injury from trying to work too quickly, forgetting about safety... if you can figure out a way to do something in less time, keep your secret within the team. This is your time, you've earned it."*[27]

The implication of this is that the firm is learning from the best practices of production workers, a key element of the learning firm, and is an essential part of continuous improvement. While as a system this represents a paradigm shift, for workers it does not necessarily represent improved quality of working life. It is thus not certain that workers and unions will embrace the implementation of Japanese Manufacturing Techniques which in turn is likely to inhibit the process of diffusion.

6.1.4 Management by blame:

Statistical Process Control has also been referred to as 'management by blame'. Lloyd (1994:p. 10) argues for instance, that the use of visual management techniques to display workers capabilities, absenteeism, quality rate and so on are also part of the system of discipline, and the threat of having ones record publicly displayed is a deterrent to producing poor quality. Proponents, such as Wilson et al (1995) argue that it is only when the systems are misapplied that they could tend toward blaming, and applied correctly SPC is actually a way to remove the ad hoc way in which blame is apportioned by identifying the real causes of problems.

[27] The authors footnote here that to advise workers to keep their ideas to themselves is a violation of the contract between the plant and the union, which commits the union to supporting continuous improvement activities.

It would thus seem that again, SPC can not be considered to be inherently a better system for workers, but much depends on how it is applied. Also, workers who lack training in statistical methods could regard the charts as another form of work appraisal and control (Wilson et al, 1995:p. 81).

It appears thus that one should question the arguments that the Japanese System is necessarily more humane. Aspects of Taylorist control still remain and seem to be intensified. This is compounded in plants which have not adopted supporting human resource practices, and which retain hierarchical forms of control. The impact of implementing Japanese Production Practices piecemeal could mean that the nature of work remains much the same. It might be that at the initial stages of changing over from a mass production system to a Japanese system would be rewarding and interesting for workers as there is much opportunity for improvement and they are being consulted for the first time in their working lives. Yet, as the systems become tighter and the potential for increased kaizen becomes limited, so the initial enthusiasm may wear off, and this is where supportive human resource practices come into play. As Williams et al highlight "... this kind of problem is not an invariable system characteristic but a variable operating characteristic which results from a loss of commitment to operating the established 'system' at a high level of efficiency." (Williams et al, 1992:p. 339).

6.1.5 Compliance or commitment?:

It is in this context that that the so called "treasures of Japanese Management" emerged, namely personnel and industrial relations practices, lifetime employment and seniority based wages (Morris and Wilkinson, 1995:p. 723). These are not seen by Morris and Wilkinson (1995) as victories for workers, as Womack et al (1990)and Best (1990) conceptualise them, but as an attempt to divert the threat to managerial prerogative, and as a way to buy compliance (as opposed to commitment) from Japanese workers. They highlight that often what is thought of as loyalty in Japan is actually compliance to overarching managerial power.

Elger & Smith (1994:p. 40 argue that Toyota's achievements should not be seen within the context of "the benign characterization offered by the apostles of 'lean production', where a bias towards capitalizing on workers expertise - to working smarter rather than harder - arose from (i) management prowess in coping with shortages of capital and small batch sizes, and (ii)

management's respect for the achievements of post-war unions in institutionalizing the position of core workers as a fixed cost. Rather we have to recognize ... that the JIT and QC innovations at Toyota involved a systematic drive towards the intensification of work, premised upon the defeat of the more radical post-war unions ...".

I adopt a position somewhere in between this argument above. I do recognise that the canons of efficiency of the Japanese System represent increased competitiveness and effectiveness for firms which have aligned these objectives to their company strategy. In this sense, the JMT's represent new ways of managing production, and for those firms that achieve systemic adoption, could represent more stability for many firms and their workers. For the worker however, the labour process remains much the same, and can be intensified incrementally over time. But one should not forget the workers ability to resist and influence the shape of the improvement programme. I also recognise that the systems have been applied in Japan in the context of weak and compliant company unions.

Other implications for labour concern the questions of job security, labour solidarity and a division of labour on both a national and international level.

6.1.6 Job security:

Proponents of JMT's argue that workers are no longer considered a substitutable factor of production, as their tacit knowledge and experience within the firm are central to continuous improvement (Best, 1990; Womack et al (1990, p. 54). Further, if improvements in production are to be associated with job losses, it is unreasonable to assume that workers will be involved in their own demise[28] (Wilson et al, 1995:p. 44).

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[28] For this reason, proponents argue that creative solutions have to be found to re employ excess labour once processes have been improved. According to Faull (personal discussion), in Toyota SA, the best problem solvers would be removed from the line and used in a problem solving capacity. At Mercedes, 250 workers who were to be retrenched (even though they have not restructured yet) have been included in a training pool (Personal Interview, 1996). In Sony's San Diego plant there have been no lay offs since the plant was established in 1972. Excess workers are reassigned to maintenance or training during downturns (Kenney & Florida, 1995:p. 797).

While it may be true that workers are considered a fixed cost in Japan largely due to the system of life long employment[29], without this system the focus on waste also means how to cut out indirect labour. This can thus be viewed as a threat to job security.

It would thus seem that unless firms are prepared to find creative solutions for excess labour, job loss is likely to be associated with the implementation of JMT's. In fact, management literature suggests that firms down size before embarking on change programmes and then offer some sort of job security to the remaining workers in order to gain their commitment to engage in the process (Elfick, 1994:p. 101).

Also, the move towards outsourcing is viewed as a threat to labour as conditions and benefits in smaller enterprises are not as favourable as those in the larger firms.

6.1.7 Division of Labour:

It is in the light of the latter point that it has been argued that implicit in the Japanese system of production is the division between core and peripheral workers with the good conditions of employment and highly skilled labour in the final assemblers, and decreasing conditions of employment and skill as one goes down the tiers. "Wages in firms with less that 29 employees were less than 60 percent of wages in large enterprises in 1983." (Best, 1990:p. 163; Kamada, 1994, places this figure between 60% & 70%). Workers in small enterprises comprise, or what Kamada refers to as "the lower end of the dual economy", comprise about 70% of the total employment (Kamada, 1994:p. 97). This also has implications for women who primarily occupy the low paying flexible jobs as part time workers who don't receive any of the benefits of full time employment (Kamada, 1994:p. 99).

[29] It seems that the practice of life long employment is increasingly under threat in Japan, mostly due to the practice of loaning out workers to subsidiaries (Kamada, 1994). This system increases job insecurity as workers in subsidiary enterprises are pushed out to make way for loaned workers. Further, percentage of workers who have a sense of responsibility, and work with pride, is lowest amongst loaned employees. Kamada thus questions how long the mutual relationship between management and labour can be maintained in Japan, and how this will effect the process of continuous improvement (Kamada, 1994:p. 106). This brings into question the sustainability of the Japanese trajectory of success, and indicates that without such a system the process of diffusion is likely to be difficult.

Many have categorised the relationship between parent and supplier firms as exploitative and dependency forming. Best (1990:p. 163) argues however that while the firms face competitive pressures from parent firms, many have responded to the pressures by pursuing product led strategies that will lead to their increased independence. Both of these examples are probably true.

It is argued that this division of labour exists at the international level as well (Dedoussis, 1995, Abdullah and Keenoy, 1995). These authors argue that the phenomenon of a core-peripheral workforce is central to Japanese management. It seems to make sense that this dichotomy would contribute to the competitiveness of Japanese firms, and hence would imply that adopting the techniques alone without the accompanying institutional context would not give Western firms the competitive edge they are seeking. This would again inhibit the process of diffusion.

The main point raised above is that the benefits of Japanese management are confined to a small group of core workers. This core is also diminishing as the practice of loaning out workers increases (See footnote 24). This has negative implications for workers and for unions who find it difficult to organise in the smaller enterprises. This also raises the question of the transferability of the system to developing countries with an under developed SMME sector. The universal applicability of the system is thus again brought into question, and these factors work against rapid diffusion.

6.1.8 Labour solidarity:

It is also argued that LP destroys labour solidarity by turning each part of the production process into customers and suppliers (Lloyd, 1995:p. 11). It is also argued that negative peer pressure is used to deter absenteeism and other anti-efficient behaviours. It is argued that these techniques encourage workers to control one another in more efficient ways than management ever could. This system is also said to impact negatively on union organisation. Representing an individual worker in this situation may mean going up against the team, not the employer "... in other words, teams can pit worker against worker, and in doing so, break the solidarity on which unionism depends." (Lloyd, ibid: p. 16; see also Delbridge, 1995:p. 815 for empirical evidence substantiating this point).

Wilson et al (1995) highlight that in mass production firms, because of the specialisation and divisions, and the way that incentive schemes are worked out, the shifts are often set up to compete

against one another for efficiency or to beat targets. This they argue, is antithetical to the system of continuous improvement which depends on co-operation between workers and departments to solve problems (Wilson et al, 1995:p. 39). Delbridge (1995:p. 812) however finds in his research at a Nippon plant in Wales, where every defect is traced back to the individual operator each being accountable for their own quality, that the workers resented the strict monitoring of their work by other team members, and argued about whether defects should be recorded against their name - this he calls 'self-policing'. He also found that as a result of the stress in the system groups would bond internally, and place blame for problems with other groups. This harnessing of peer pressure he argues, undermines the sense of collectivity amongst the labour force. This was compounded in this plant by the lack of active independent representation by the union. (Delbridge, 1995:p. 815).

It seems clear that the struggle over managerial prerogative and discipline remains within the Japanese Manufacturing System, and that it can not be assumed that increased co-operation amongst workers is a system characteristic.

Considering the aspects of the association of JMT's with job loss, a division of labour and decreasing employment in the formal sector, as well as the perceived threat to labour solidarity, it is likely that unions are going to intervene in the process of adoption and this will in turn affect the process and rate of diffusion, and the shape of the techniques employed.

In sum, in this section I have discussed the implications for labour which arise out of the adoption of JMT's. The aim has been to question the extent to which JMT's represent a significant paradigm shift in the nature of work for workers. I have argued that it can not be assumed that JMT's necessarily result in an improved quality of working life, the implication of which is that conflict is likely to remain in production. Adopting a purely technical view as to the nature of JMT's leaves out people as agents and as such is not necessarily useful in an analysis of diffusion.

7. Conclusion:

The primary contribution of this chapter has been to critically examine the notion that JMT's represent a universally applicable system, which should be adopted in every enterprise the world over in the immediate future, to the benefit of both management and labour. Such an argument is proposed by those who adopt a technical view and who would place the process at the centre of

analysis. By reintroducing the social into the technical, I question the legitimacy of this approach and show that the process itself is not likely to result in increased commitment to the system. I have thus attempted to address in this chapter Humphrey's criticism of the Lean Production approach (as identified in Chapter One) which is that firms are often lead to consider techniques without considering questions of labour relations, incentives and labour market conditions.

In this chapter I have identified the factors which have given rise to the ascendancy of the Japanese Manufacturing Techniques, such as the increasing differentiation and volatility of today's increasingly global markets. It is the ability of Japanese enterprises to respond quickly and flexibly to market demand, which makes the techniques employed well suited for these competitive conditions.

JMT's are only one model of productive efficiency and the choice of production strategy must be aligned to the company's competitive strategy. This has two implications, *firstly*, that the techniques are probably not suited to all companies, and *secondly* that the companies employing them without consideration of their competitive strategy, are not likely to reap the long term benefits. These factors suggest that the spread of diffusion of JMT's is likely to be uneven.

In order to address the question of whether JMT's represent a new paradigm of organisational efficiency and social relations, the key principles underlying them have been examined and the implications for labour discussed. I have argued that the three key principles on which JMT's rest do represent a new way of thinking about production. These are a focus on the elimination of waste and uncertainty in the production process, within the context of continuous improvement. These factors require a new approach to measuring and organising production. For mass producers wishing to adopt JMT's they represent a fundamental paradigm shift which would not be easy to achieve. I have also discussed that the implementation of continuous improvement is not simple and many companies do not progress beyond the initial stages.

The implementation of Japanese Manufacturing Techniques for workers may represent a continuity with mass production, and the degree to which there are changes in the social relations in production depends largely on the degree of workers participation in firm level learning. Without team work and problem solving by shopfloor workers, the physical manifestation for labour remains much the

same. This is because work itself remains highly routinised, controlled and is even intensified. It is also argued that Japanese Management Technique's may not represent a reintegration of mental and manual labour to the extent suggested by proponents of the system. The system of Japanese production management can also lead to greater pressures on labour, and it can not be assumed that improved quality of work life is an inherent system characteristic. It seems that these practices can exist in different labour relations contexts - they are not inherently humane or empowering as suggested by the proponents, but it could be that much depends on how they are implemented and on the culture of the firm. This does not mean that workers should necessarily reject the adoption of JMT's, as they have the ability to influence and shape the circumstances in which the techniques are adopted. Also, in the long run, the potential increases in productivity are probably in their interests as well. Increased productivity is a necessary condition for a high-wage strategy. The overall implication of this discussion is that it must be recognised that the shape and nature of the diffusion of the techniques is not predetermined, and that workers are likely to respond to their implementation in many ways. What I have shown here is that since conflict is thus likely to remain in the production relations of firms adopting JMT's, and that since the various stakeholders will attempt to shape the change programmes according to their interests, one can not easily conclude that the process of diffusion will be smooth and rapid.

Further, the techniques are embedded in Japanese social and economic relations, for instance the system of supplier relations and the three treasures of Japanese Human Resource management. Without these factors the transfer to firms in other countries is more complicated, and would militate against rapid diffusion.

In the following chapter I focus specifically on the question of diffusion of Japanese Manufacturing Techniques to manufacturing enterprises in developing countries, and look at whether there are conditions specific to developing countries which might affect the process of diffusion.

Chapter Three: The diffusion of Japanese Manufacturing Techniques to developing countries:

1. Introduction:

In Chapter Two I examined the principles Japanese Production Management, and concluded that they do involve substantial changes in approaches to production management. The implication of this is that workplace change is not likely to be an easy process. It has also been shown that it cannot be assumed that technical change will result in an improved quality of working life. Focusing on the techniques themselves - abstracted from the Japanese social and institutional context - is thus not useful for an analysis of diffusion. The reality of transfer is much more complicated than is suggested by the universalists. In this chapter, I turn to the question of the adoption of Japanese production management techniques by firms in developing countries. The spread and use of Japanese Manufacturing Techniques in developing countries is examined, in order to determine if there are factors specific to these countries which could affect the systemic adoption in firms, and hence the path of diffusion. From the evidence presented it would seem likely that the tendency would be towards the non-systemic adoption of Japanese Manufacturing Techniques, which suggests that the breadth of diffusion would be uneven.

Many companies throughout the world are engaged in restructuring their operations in line with Japanese Production Management, and governments have set up specific support policies to disseminate the practices of Japanese Management to companies. It is the implicit intention of the Manufacturing Roundtable's' Best Practice Initiative to disseminate these practices to manufacturing enterprises in South Africa, (which is the project from which the research in this thesis is drawn) and thus the issue of diffusion and adoption of these techniques is examined[1]. The issue of transfer relates to both domestic firms which adopt Japanese Manufacturing Techniques and to Japanese firms abroad. The field research is concerned with the former and hence this will be the focus of investigation.

[1] The activities of the Manufacturing Roundtable are largely directed by the members of the Roundtable which include large South African corporations such as SAB and Plessey, the Department of Trade and Industry is also a member. This indicates the importance which some leading firms place on an investigation of the transfer of JMT's to South Africa.

1.1 Background to the adoption of Japanese Manufacturing Techniques in developing countries:

This section provides a brief background to the factors which have contributed to the ascendancy of Japanese Manufacturing Techniques in manufacturing industry the world over.

Manufacturing industries in developing countries are facing growing competitive pressures due to the opening up of domestic markets to manufactured imports, and entry into the export market (Humphrey; 1995, p. 1). Globalisation implies that "the number of competitors with a world wide reach is increasing, and markets that were traditionally considered impenetrable are slowly opening up to competition from other countries.". (Chittipeddi, K & Wallet, T, 1991:p. 94). Chittipeddi et al (1991) highlight that the implications are that in order to face up to this challenge price, quality and service standards will have to be met on a global level and traditional management practices and philosophies will have to change to make them more consistent with a turbulent or rapidly changing environment. This view is supported by Lee, C & Golhar, D (JSBM, 1991:p. 43) who argue that "To be competitive in a global market, a manufacturing firm, regardless of its size, must devise ways to produce quality goods at lower-cost". Low wages are no longer enough to attract foreign investment, and productivity and quality are critical at the level of the firm (Shaikin, 1990:p. 8).

An environment of import substitution and protectionism has not lent itself to high degrees of efficiency and effectiveness in firms in many developing countries, including South Africa. Government policies such as the Growth Employment and Redistribution plan (GEAR), programmes of tariff reduction and so on are clearly aimed at liberalising South Africa's markets and opening them up to foreign competition. The Department of Trade and Industry is refocusing it's policies away from protective measures and shifting towards supply-side measures. Resulting from this reorientation is the "Workplace Challenge" project, a joint initiative of the Trade and Industry Chamber of NEDLAC and the National Productivity Institute (NPI), which is aimed at addressing productivity in South African enterprises and has been "... set up to help meet the challenge of South Africa's re-entry into the global market." (Skhosana, 1997:p. 79). A key ingredient of the "Workplace Challenge" is the implementation of best operating practices at shopfloor level (Skhosana, 1997:p. 80). Changes in industrial organisation and the adoption of Japanese

Manufacturing Techniques are thus being seen as important conditions for increasing the competitiveness of firms[2].

1.2 Advantages of the adoption of Japanese Manufacturing Techniques for developing countries:

It is proposed that there are many advantages of Japanese manufacturing techniques for developing countries:

a) the cost of adoption is low;

b) they are not capital or foreign exchange intensive;

c) they increase productivity growth and reduce production costs;

d) they allow firms to serve customer needs better;

e) they aid exports by improving quality and reliability and lowering costs;

f) by promoting flexibility, they allow firms to respond to external shocks and changing market conditions (Institute for Development Studies, www: 1995)

Hence, the adoption of Japanese Manufacturing Techniques by developing countries, may provide "... accessible, cost-effective methods to improve performance, based upon new forms of production organisation and labour utilisation, rather than requiring investment in expensive new equipment (Posthuma; 1995, p.103). Comparisons of international experience shows that returns to investment in organisational change are considerably higher than to those arising from fixed investment. Moreover, investment in costly equipment may be wasted unless there is prior change in the organisation of firms, and the relationship between firms. For foreign exchange constrained economies, organisational change has the additional attraction of neither being capital nor foreign exchange intensive. Increasing the capacity utilisation and competitiveness of firms, is also likely to make them more efficient users and earners of foreign exchange.

There are however concerns about the transfer of Lean Production to developing country environments. Arguments which focus on the cultural aspects of the success of technology transfer

2 This issue is much debated in the literature (see for example Meyer - Stamer (1995), William's et al (1992) & Black, 1994) and some of these issues are highlighted in Chapter Two.

are increasingly less significant as it becomes evident that the barriers are not absolute; a number of Western firms have made progress in assimilating Japanese organisational procedures (Kaplinsky; 1995, p. 57). The implementation of Japanese Manufacturing Techniques is however not easy and much depends on the conditions which exist in the firms, and the countries in which they are located. As discussed previously, the Lean Production approach focuses too narrowly on the techniques themselves as the point of departure.

It is often argued that there are factors specific to developing countries which inhibit the adoption of Japanese Manufacturing Techniques (Kaplinsky; 1995, p. 57). Kaplinsky (1995) highlights three common problem areas faced by developing countries; *firstly*, the lack of a suitably educated and trained workforce, *secondly*, the lack of reliable suppliers who can supply quality goods with consistency and *thirdly* the lack of commitment and capability on the side of management. Other features of developing country economies such as large wage differentials, job grading and high levels of shopfloor conflict could also impose constraints on adoption (Joffe et al, 1994; Black, 1994:p. 27). These issues are explored later in the text.

2. Catalysts to the adoption in developing countries:

Factors which act as catalysts for adoption are likely to influence the spread of diffusion. One of the assumptions underlying the rapid diffusion scenario, (as highlighted in the introduction) is that strong competitive pressures will lead to firms adopting techniques of Japanese Management. From a survey of the literature it would seem that competitive pressure does not always provide optimal conditions for workplace change, and companies do not always respond to competitive pressure by adopting the techniques of Japanese manufacturing management. There are a number of other factors including leadership, and the membership of Transnational Corporations which push companies in the direction of JMT's.

The factors which could act as catalysts to organisational reform in developing countries as discussed by Kaplinsky are presented below [3] (1995:p. 61).

3 Humphrey highlighted that competitive pressure was one of the aspects which would determine the extent to which JMT's would be diffused in LDC's. To recall, Humphrey highlighted that if one assumes that competitive pressure is a good catalyst for the adoption of JMT's, then one would foresee diffusion as being rapid or steady(see page 26).

2.1 Competitive Pressure

This question of the influence of competitive pressure on the adoption of JMT's is examined below, and it is argued that while competitive pressure may be increasing in developing countries, it can not be assumed that this will induce firms to adopt Japanese Manufacturing Techniques.

Kaplinsky (1995) argues that while the changes in competition, such as trade policy reform and liberalisation, are an inducing factor, their significance is often overstated. He argues that there are many cases in which the adoption of Japanese Manufacturing Techniques has not been caused by competitive pressures, and that there are in fact "a range of market failures which provide added evidence that enhanced competition is not a sufficient factor to induce the use of JMT's." (Kaplinsky, 1995:p. 61).

Black (1995) highlights that the effect of trade liberalisation could either be a catalyst for the adoption of Japanese Manufacturing Techniques or lead to a decline in manufacturing. In the SA'n motor industry, for example, Black demonstrates that firms have adapted positively to the challenges presented under Phase VI[4] and from the new programme of tariff liberalisation. The expected responses of firms to these new programmes has been primarily to improve production efficiencies, expand exports and increase investment. These, he argues, are positive signals, as import liberalisation could just as easily result in the deindustrialisation of the auto sector, turning it into a distribution channel for imports (Black, Trade Monitor Vol. 11, 1995:p. 24/5). The effect of tariff reductions is also likely to create sectoral differences in competitive pressures as tariffs in certain sectors are lowered faster than in others.

Other macro-economic issues in developing country environments namely, high real rates of interest and instability also affect diffusion. Kaplinsky suggests that the high real rates of interest existing in developing countries since the 1980's are a catalysing factor as firms are induced to reduce stock levels and hence look to JIT as a technique for doing so. He suggests thus that the instability in factor and product markets in developing countries means that the flexibility which can be achieved through the introduction of Japanese Manufacturing Techniques is particularly attractive (Kaplinsky, 1995:p. 62). Humphrey (1995b: p. 781), however, in his study of the Brazilian experience, found

4 Allowing exports to be counted as local content, placing greater competition on local content suppliers

that macro-economic instability could undermine all company efforts to sustain the introduction of Japanese Manufacturing Techniques which are dependent on offering labour stability. He offers the example of Brazil where "In the late 1980's and early 1990's, a succession of stabilisation packages created sharp fluctuations in the level of economic activity. This undermined attempts by some companies to use labour force stability as the central support for a new pact with labour." (ibid.).

The role of government policy is critical. Changes in policy can cause fluctuations, such as the introduction of the 'peoples car' policy in Brazil in 1993, which caused increases in demand in some firms, and resulted in a break down in the system as established work routines were turned upside down (Humphrey, 1995:p. 782). It is also important that other supply side measures are adopted to support companies in an environment of increased competitiveness. According to Fleury the Brazilian government introduced policies to improve the competitiveness of Brazilian industry, such as the Brazilian Programme for Quality and Productivity (BPQP) and trade reform. He argues that these initiatives were undermined by the governments failure to provide a stable and consistent economic policy, and its failure to address basic needs such as housing, education, health and transport. This has impacted negatively on firms decisions to introduce quality and productivity programmes. "The principle criticism, therefor, is that the government has placed companies in a dangerous competitive situation by liberalizing the domestic market for imports, without providing the conditions necessary for companies to compete with a chance to win. In this way, the modernizing propositions of the BPQD ... do not appear to be supported by other governmental policies." (Fleury, 1995:p. 84). Fleury concludes thus that the strategic direction of firms is influenced by government policy, and that a lack of direction and instability which exist in Brazil for instance, can hamper the development of competitive strategies at sectoral and firm level (Fleury, 1995:p. 84).

2.2 Other factors governing adoption:

There are other important factors which influence the adoption of JMT's including leadership, membership of Transnational Corporation, benchmarking and the desire to export. These factors are expounded below and shows that if competitive pressure cannot be assumed to lead to the adoption of JMT's, there are other factors which push enterprises in the direction of their adoption.

Kaplinsky (1995:p. 61) suggests that perhaps the single most important factor in the introduction of Japanese Manufacturing Techniques in firms in developing countries is **leadership**, where the Chief Executive Officer has introduced the changes, often having to overcome resistance from within the organisation, and in the face of scepticism in general. It becomes apparent however that often top management suffers from the "blue-bird syndrome" (Mr Furuhashi, BPI, Jan. 1996), watching out for the next management fad which comes along.

Transnational Corporations (TNC's) have also been a catalyst to adoption. Often, TNC's expect certain levels of quality from their domestic suppliers, often encouraging the introduction of ISO 9000 quality standard, as well as small lot frequent deliveries. Thus the pull of customer demand is also a considerable factor in the introduction of Japanese Manufacturing Techniques. This does not mean that all TNC's expect their subsidiaries and suppliers to adopt Japanese Manufacturing Techniques, but they can act as a stimulus to adoption. (Kaplinsky, 1995:p. 62).

Benchmarking, or learning by visiting, is another factor which stimulates adoption. Firms are increasingly looking to see what their competitors are doing, and following similar strategies. Visits to overseas factories by management are also a reason for change (Fleury, 1995:p. 81).

Fleury (1995:p. 81) reports that in a study of 18 Brazilian firms adopting quality programmes, **export markets** were most important motivating factor.

In sum, competitive pressure is an important consideration in the choice of strategy for manufacturing firms. In the above discussion it is suggested that *firstly*, not all companies choose to focus on manufacturing strategy to improve their competitive position. Competitive pressure may in fact inhibit systemic adoption in the absence of other policy measures which would help companies prepare for the competition which results from trade liberalisation. *Secondly*, it can not be assumed that those which do will choose to adopt Japanese Manufacturing Techniques. Japanese Manufacturing Techniques might just represent one competitive paradigm amongst many. As such, the firms choice of technique is influenced by factors such as customers, membership of TNC's and leadership.

3. The extent to which the paradigm is seen as systemic:

Another of the questions upon which an analysis of diffusion rests is the extent to which the paradigm is seen as systemic: *"Is JIT/TQM a set of principles or techniques whose effectiveness depends to a large extent on the adoption of a complete package of interrelated changes?"* (Humphrey, 1995a: p. 153). My argument is that improvements can be made with the use of certain tools applied as stand alone techniques, however, with systemic adoption the co-operation of the employees, and improvements in production are likely to be most sustainable. However, since short term success can be achieved with limited implementation, this could mean that firms do not follow through with more systemic implementation. It is important to clarify that systemic adoption does not mean that all the techniques need to be adopted at once. As highlighted previously in this thesis firms are likely to begin with the use of techniques such as 5S, and move on to more sophisticated techniques. The question really is, whether there are factors specific to developing countries which will inhibit the incremental adoption of the techniques which would lead to a systemic package.

3.1 The depth of systemic adoption:

The question of the depth of systemic adoption at firm level is central in an analysis of diffusion as it is likely that the greater the success of adoption, the more rapidly the use of the techniques will spread across firms.

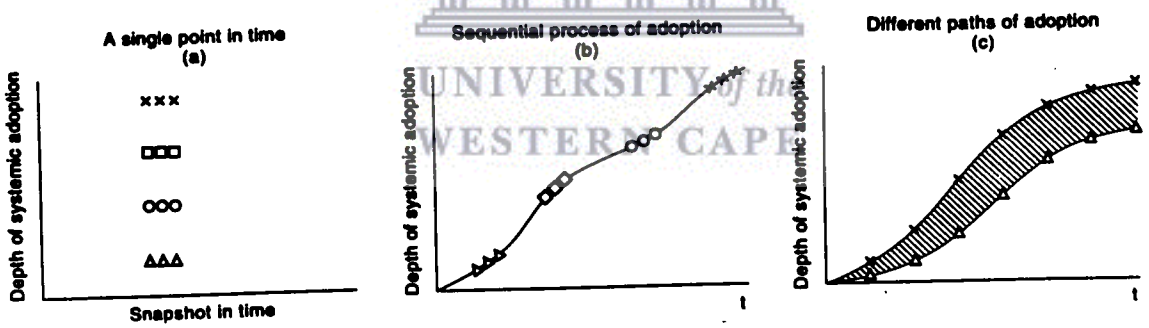
Kaplinsky (1995) considers the question of the depth of systemic adoption in firms, and also codifies experience into sequential and non-sequential adoption. Kaplinsky argues that the success of transfer "... is more a matter of the degree of adoption and the particular sorts of techniques which can be successfully implemented in LDC's[5]" (Kaplinsky; 1995, p. 57). Kaplinsky's central argument concerns the difference between the adoption of specific techniques and the adoption of Japanese management as a production system in a co-ordinated way. Like Kaplinsky, I argue that while the adoption of specific techniques can be relatively easy, and can lead to improvements in production, in order to achieve sustainable and continuous improvement companies which choose to compete in this terrain should adopt a systemic approach.

5 LDC stands for Less Developed Country /ies

Figure 2 below provides a snapshot view of the breadth of adoption of 'Japanese management principles' (Kaplinsky: 1995:p. 63) world-wide in 1993/4. The following table, Table 5 describes the spectrum of different degrees of systemic adoption in enterprises. Figure 2 provides a framework for locating firm level implementation or the depth of systemic adoption, in a broader picture of the breadth of adoption. Figure 2(a) indicates that the systemic adoption of Japanese Manufacturing Techniques is varied at any given point in time. The question is what this represents in terms of the possible paths of diffusion of Japanese Manufacturing Techniques. This spread depicted in Figure 2(a) could indicate different paths of diffusion as discussed in the Introduction. It either represents that firms are following a sequential route towards systemic adoption as depicted in Figure 2(b). This would imply a rapid or steady diffusion scenario. On the other hand, it could mean that firms are on fundamentally different paths of adoption, some being constrained by various factors in the path to systemic adoption [depicted in Figure 2(c)]. This is what is described in the Introduction as uneven diffusion (Kaplinsky, 1995:p. 62). The uneven diffusion scenario is a result of the "systemic gap"[6]. The main body of this chapter investigates the factors which could impede systemic adoption by firms in developing countries, and contributes to the 'systemic gap'.

Figure 2

Possible paths of diffusion:



Source: Figure 1. Adoption of Japanese management principles, Kaplinsky 1995:p. 63

3.2 Spectrum of Systemic Adoption:

Kaplinsky (1995:p. 59) draws a spectrum of different stages of implementation from low adoption to high adoption, while recognising that the process might not be linear or sequential.

6 To recall the definition of the "systemic gap" provided in the Introduction; in a scenario of uneven diffusion, firms on the upper curve are capable of deep systemic adoption whereas those on the lower curve may represent firms which are inherently constrained in their adoption of JMT's either by their sector of operation or their external environment. Kaplinsky (1995:p. 62) refers to this as a "systemic gap".

Table 5

Spectrum of Systemic Adoption:

Table 2. *Typology for adoption of Japanese management techniques*

	High ← Spectrum of Adoption of Japanese Management Techniques → Low					
Type of firm	**The Eastern archetype**	**Successful follower**	**Moderately successful follower**	**Weakly successful follower**	**Outright failure/ regression**	**Traditional mass producer**
Arena of implementation	Throughout firm	Throughout firm	Individual plant(s)	Individual subprocesses	Little change in procedures	None
Organizational procedures include	Cellular production Small lot production JIT and TQC Multiskilling Team-working Small batch production Continuous improvement	Cellular production Small lot production JIT and TQC Multiskilling Team-working Small batch production	Cellular production Smaller lot production JIT and TQC Multiskilling Team-working	Cellular production Smaller lot production JIT and TQC Multiskilling Team-working	Attempts at JIT and TQC	Functional layout Extended division of labor and Quality Control Just-in-case inventories Standardized products Large lot production Large batch production
Supplier relations	Close and frequent contacts with suppliers and customers	Growing contacts with suppliers and customers	Little contact with suppliers and customers	Adversarial relations with suppliers and customers	Adversarial relations with suppliers and customers	Adversarial relations with suppliers and customers

Source: Table 2 'Typology for adoption of Japanese Management Techniques' Kaplinsky, 1995 :p. 60

Table 5 shows a continuum at the low end of which lies **traditional mass production** organisations, and at the other extreme is the **"Eastern archetype"** where continuous improvement and flexibility in production are achieved through the use of an interrelated and systemic program[7]. He characterises firms in between as being those which attempt to introduce new production methods and have relative degrees of success.

The **"outright failure or regression firms"** are those which have introduced Japanese Manufacturing Techniques as stand-alone techniques, yet have failed to accomplish any significant change. There is often a short term improvement evident in these firms, but Kaplinsky (1995) suggests that after a while the improved performance subsides. Kaplinsky (1995) states that often these firms believe that they have altered their operations and that they have implemented aspects of Japanese Manufacturing Techniques.

These firms are followed by "weakly successful" follower, to "moderately successful" to "successful" and finally to the "Eastern archetype". The **"weakly successful"** followers are firms which have managed to make changes in a limited area of the production process, but these have not been extended throughout the factory. Following this are the **"moderately successful followers"**. This

7 An example would be the adoption of Just in Time without a focus on the Single Minute Exchange of Dies, as discussed in the previous chapter.

case represents firms which have implemented JMT's throughout a single plant, but not in the company as a whole. The gains of this implementation are likely to be limited as they cannot reap the benefits of overall systemic efficiency.

The **"successful followers"** are those firms which are able to introduce the full range of JMT's throughout their productive operations. While Kaplinsky notes that not all firms will progress along this sequential path, it is the path which was followed by Toyota, and other successful followers in the West (Kaplinsky, 1995:p. 59). Kaplinsky highlights that successful Western followers, such as Hewlett Packard and Motorola, have encountered two major obstacles in catching up to the Japanese firms. These are *firstly*, in relation to securing employee involvement in Kaizen (CI), and *secondly*, with regard to strengthening their relationships with suppliers and customers, especially with regard to obtaining a commitment to delivery of zero defect supplies (Kaplinsky, 1995:p. 61).

Kaplinsky (1995:p. 61) concludes by arguing that "[C]onsequently , even the most advanced of these Western followers remained some distance behind the Japanese innovators, who, in turn, represented a moving target as they continued to deepen their adoption of these organizational principles." If one recognises that Japanese Production System is supported in Japan by Human Resource practices and systems of supplier networks, (as discussed in Chapter Two), then one can argue that the process of systemic adoption would already be hindered by the absence of these factors in other countries.

It seems to be important to bear in mind that just like Fordism and Taylorism were adopted and diffused unevenly (even in America the country of first diffusion), and some firms were better at it than others, so the same could apply to JMT's. "The history of the diffusion of Taylorism and Fordism in developing countries is one of adaptations to local environments and partial use of techniques." (Humphrey, 1995a: p. 153; Williams et al (1993) in Elger & Smith, 1994:p. 11). Just like mass production was transferred unsuccessfully in many enterprises, so it is likely that the same would be true of Lean Production. Further, as Mathews highlights, the principles of productive efficiency pertinent to mass producing firms were applied even in firms which weren't employing mass production strategies. "But outside the MPS system (sic) which, after all, never attained a majority proportion of productive activity in any country - not even the USA - these cannons of efficiency had no purchase at all. Yet they have achieved almost total dominance as the preferred

first approach, being seen to apply to batch-based production work and even to the activities of public sector agencies such as transport and health systems that have nothing in common with the MPS." (Mathews, 1994:p. 30). This, Mathews argues, is the paradox of the twentieth century, which is only arising now as the mass manufacturing sector moves into decline. It seems however, that the same dangers could exist for the Lean Production System. It may be that they are more appropriate in some industries or sectors as opposed to others and for some firms the system may be inappropriate. The relevance of the techniques for different sectors is another area which needs to be explored in further research[8].

4. The adoption of Japanese Manufacturing Techniques in developing countries:

Empirical evidence of the use of Japanese management techniques in developing countries is growing (although it is still limited and has only recently been collected, mostly in 1993/4) and hence studies of diffusion are possible (Kaplinsky, 1995:p. 62). This evidence highlights that there is a high degree of diversity in the application and implementation of these techniques. This thesis contributes to the collection of empirical data on the adoption of JMT's in developing countries and is presented in the following chapter. The discussions in this chapter inform the categories of analysis for the evidence collected in the field research.

Kaplinsky (1995:p. 61) found that there are examples of "successful followers" in developing countries such as Crompton Greeves, an electrical engineering firm in India and Ford's Hermosillo plant in Mexico. Most of the sophisticated developing country adopters fit in to the category of "moderately successful" followers, introducing techniques in individual plants and often quite systemically. The spread of implementors in developing countries however mostly falls within the categories of "weakly successful" followers or "failures".

8 Another area for further research is to examine which techniques and practices Japanese firms are transferring abroad. This issue has been raised in Chapter Two, where it is suggested by authors such as Dedoussis (1995) that there is an international division of labour with regard to the transfer of Japanese techniques, with core practices not being transferred to other countries. The question is, if the Japanese paradigm is so efficient and systemic, then why are the Japanese themselves not replicating it in their foreign enterprises? Also, what does this mean for labour - intensive industries in the LDC's. Does it mean that JMT's aren't appropriate across industry or does it mean that it is just not worth fighting against an established system? For a discussion of the techniques used in Japanese firms abroad, see Kenney & Florida (1995).

4.1 Impediments to systemic adoption in developing countries:

The main question in this chapter concerns whether there are impediments to adoption outside of Japan, specifically in developing countries. Since few Western firms and fewer firms in developing countries have systemically adopted JMT's, the question is whether this reflects a sequential process of diffusion (with firms in developing countries being late starters), or whether there are specific problems for adoption outside of Japan (indicating a 'systemic gap'). Based on case study evidence, Kaplinsky (1995) examines whether there are any factors specific to developing countries which contribute towards, or inhibit, the systemic adoption of JMT's by firms in these countries, or whether the low evidence of the systemic adoption of these technologies in developing countries simply reflects that these firms are late starters in a sequential process of innovation.

Kaplinsky suggests that the "systemic gap" in developing countries might be caused by a number of factors. He distinguishes between factors in developing country environments which can be corrected, (both internal and external to the firm) and between external factors which are beyond the control of the firm and which may arise from the "real operating conditions of LDC's and which may be far less amenable to change." (Kaplinsky, 1995:p.62). In the case of the former, if these factors can be corrected, then it is reasonable to assume that implementing firms will be able to reach the high point on the curve, as they continue to restructure their operations. In the case of the latter, it may mean that the systemic gap will remain, and that no matter what firms do to restructure their internal operations, they will remain on the lower curve in terms of systemic adoption (Kaplinsky, 1995:p. 62). Thus diffusion is likely to remain uneven.

Factors internal to the firm which can be changed include strengthening lines of internal communication, training for workers and developing a culture of participation. This would require substantial effort on the part of the firm. Factors external to the firm which lend themselves to correction include a knowledge gap due to limited dissemination of information regarding the new techniques and poor management training. Both of these factors could be addressed through programmes to improve dissemination, as well as upgrading or modernising the educational curricula (Kaplinsky, 1995:p. 62). A more detailed examination of some of the LDC specific external factors which affect the systemic adoption in firms is provided below. The factors which emerge in the literature as being critical influences on systemic adoption at firm level include Education and

Training, Management and Workplace Industrial Relations, and inter-firm co-operation. These are discussed in detail below.

4.1.1 Education and Training:

The systemic adoption of JMT's requires a greater level of worker input than traditional mass production, in terms of techniques such as increased participation in problem solving, SPC and so on. Posthuma (1995:p 103) in her study on JMT's in Zimbabwe found that organisational reform cannot be treated only as a set of technical solutions, but the social innovations also need to be adopted. "While new organisational techniques were found to yield rapid and tangible improvements in production indicators[9], those companies which lacked participation of upper management and had inadequate policies for human resource development and training had difficulties sustaining and advancing these improvements over time".

From case study evidence it appears that training plays a more important role in the adoption of the new techniques than education, and the required education level of the workforce depends on the specific techniques which are employed. For instance, education seems to be of little importance in the use of Kanban techniques and the change to single flow production, and in fact the visual system can assist with worker illiteracy (i.e. if five products are required, five spaces are left for parts).

Kaplinsky argues however that as the use of techniques becomes more sophisticated in implementing firms, and as workers become more involved in the process of CI, their grasp of the underlying technical processes is likely to be aided by their level of schooling. He argues that for sustained and systemic adoption of JMT's formal education is important, even though improvements can be made in the short term with low levels of shopfloor literacy and numeracy (Kaplinsky, 1995:p. 64). Posthuma (1995) postulates that training is the key to sustaining the improvement. While technical and structural changes will initially yield better results, training is necessary for continuous improvement. The human resource element of organisational change cannot be ignored. Critical to continuous improvement is the task of gathering data and reflecting on experience. If staff are not

9 All six companies in the research example showed significant improvements in the initial phases of the programmes and involvement from shopfloor workers

trained in this then there is no way of reflecting on performance and the whole system becomes stagnant. Failure to invest in training was also found to undermine enthusiasm for change.

In Posthumas' (1995) research in Zimbabwe, it was found that while workers were enthusiastic about engaging in problem solving, they often lacked the capability to solve complex problems. Workers could be trained in the use of tools for problem solving and identification such as Ishikawa diagrams and ask why 5 times. However, workers can only engage in performance measurement if they are functionally numerate and literate[10]. Lloyd highlights that due to illiteracy and innumeracy, data collection, processing and display for SPC would probably remain a function of shopfloor management. This he argues, would defeat the purpose of the technique, particularly because it is likely that the only ones able to understand the data would be the same managers (Lloyd, 1994:p. 10). As highlighted in the previous chapter, this could lead to workers perceiving the data recording as 'management by blame'. It seems thus that a workforce with poor primary education can inhibit systemic adoption. Research shows that adult basic education proved to be imperative alongside on-the-job training in Brazil (Posthuma, 1995:p. 109). For instance, Humphrey (1995b: p. 772) highlights that firms wishing to introduce SPC had to begin with basic numeracy and literacy.

Training thus seems to play a critical role in adoption of shopfloor practices, for both short and long term success. Of 50 Zimbabwean firms which had adopted JMT's[11], six firms which had sustained the programme for one year were chosen as the research sample. It was found that these firms were able to make progress with regard to the introduction of the above techniques despite a poorly educated work force. In most of the adopting firms the average length of schooling was six to seven years per worker, and there was no difference in the formal schooling of workers in the relatively successful and unsuccessful adopters (Kaplinsky, 1995:p. 63). It was found however that firms which invested in training had a higher degree of success in implementation, whereas the firm which refused to invest in training despite requests from shopfloor management, was the least successful adopter. In the study it was found that firms which did not understand the relationship between technical and social innovations and how they sustain one another, were unable to sustain initiatives in the enterprise. There was a general belief that reorganising production layout (i.e.: making

10 Measuring Performance throws up variations and fluctuations in production which often indicate that a problem exists which then needs to be actualised and solved.

11 largely through the files and reports from a consultancy. The firms were examined with regard to four issues 1) management commitment and participation in the restructuring programme, 2) the education and training of Zimbabwean workers 3) worker motivation and participation 4) implications for employment.

systemic changes) would result in improved production efficiency, without considering that it is imperative to upgrade workers capabilities in order to achieve high quality and productivity. This highlights the importance of training for management as well.

Some examples from firms in Mexico and India are illustrative of the importance of training. The Ford Hermosillo plant in Mexico was located in an area where the labour force was considered to be relatively highly educated. The firm also invested heavily in training (Kaplinsky, 1995:p. 64). The implementation of JMT's in this plant is considered to be successful, and it was found for instance, by the New Auto Study on Competitive Makes (NAQSCM) that the Mercury Tracer[12], produced in this plant was the highest quality small car produced in North America, along side the Honda Civic (Black, 1994 :p. 27). As this was a new plant, they had the chance to selectively hire an educated workforce. While the workers in this plant are young and have little previous experience, it is argued that their high standard and continuous training have made up for the inexperience[13].

This contrasts with the Escort plant in India. Although it is also located in an area with a relatively educated workforce, the plant has not been as successful as Hermosillo. Unlike the Ford plant there was no considerable investment in training. Another firm in India, Crompton Greeves, considered the most successful large implementor in India, had a developed training strategy and training was considered one of the prime areas for investment (Kaplinsky, 1995:p. 64).

Training is however only effective to the extent that the firm wishes to extract value from it. A high training budget probably says nothing about the effectiveness of the training, and in research conducted by Whelan, Maule & Grütter (1995) it was found that one of the primary conditions for training to be effective in firms is that it be followed up with practical experience, what they refer to as "the reinforcement and transfer of training". Training not followed up by management was subsequently lost. The firms determination to extract value from the training could depend on the level of management commitment to the introduction of JMT's.

12 referred to as Stellar in the text

13 It must however be noted that the plant experienced high staff turnover due to the youth of the workers and their lack of experience, low wages and difficulties adapting to assembly plant work (Shaiken, 1990:p. 81)

Management's attitudes to workers also affect their commitment to training. The Zimbabwean research highlighted that racism, and the perceived threat of affirmative action (causing white management to maintain a monopoly on skills), were both factors inhibiting training provision. In one firm in Zimbabwe a Senior Manager responsible for Human Resource Development, commented that there was little use in offering the workers further training as "Africans are not mechanically inclined." (Posthuma, 1995:p. 111).

Another factor related to education is the knowledge needed to make investments in technology and technological know-how. Jones & Womack, (1985:p. 404) argue that firms in developing countries will need to have a strong engineering capability and be able to locate and make informed decisions about purchasing and absorbing the latest technological innovations, especially if they are to be increasingly engaged in R&D.

In sum, this section has highlighted that for sustainable long term improvement following the adoption of JMT's the primary education level of the workforce plays a significant role. The important role of primary and tertiary education must be emphasised in relation to productivity improvement. In light of the fact that primary education is relatively poor in many developing countries, training and adult basic education become even more important. The commitment of management to training provision and utilisation is highlighted as important, and seems to be influenced by their understanding of the socio-technical nature of the production techniques and their attitudes towards the workforce. The critical role of management in implementation generally is expanded on below.

4.1.2 Role of management:

The role of management, workplace relations and firm culture seem to be critical for the successful systemic adoption of JMT's. Kaplinsky (1995:p. 66) highlights the necessity to distinguish between different layers of management, as each has a different role to play in implementation. The layers of management are:

group management - responsible for the strategic direction of the company; firm management - responsible for factories within a specific division; plant or factory management - in charge of operations in particular plants; production management - supervise the shopfloor operations of the

factory, supervisory management - responsible for particular functions within production; and team management and/or line supervisors who are responsible for a small group of workers.[14] (Kaplinsky, 1995:p. 66).

Kaplinsky highlights that the successful Western adopters are those firms which have widespread management commitment to the process, with the support of top level management being crucial.

In Africa, Posthuma (1995) argues, management cannot afford to be a passive observer in the restructuring process and needs to be able to monitor and give feedback on the program. Top management, for instance, needs to set up the organisational structures so that a mechanism exists for production workers to pass up ideas from the shop-floor. The benefits can be huge. An example from a Zimbabwean firm is this: "... the accumulated changes which had been implemented in the principal product line had raised output from 12 to 28 units per day, using the same workforce, and reduced manufacturing time per unit from eight days to eighty minutes, as well as reducing the total distance travelled by the various individual subcomponents from two miles to 94 meters." (Posthuma, 1995: 108).

Top management support is critical in terms of leadership, providing financing and time for programmes, the testing of new ideas and so on... If top management neglects the restructuring process, the attitudes of middle management and shopfloor management can become dominant in directing the future success of failure of the programme (Posthuma, 1995). This could result in the delinking of manufacturing strategy from company strategy which, as discussed in Chapter Two, decreases competitiveness. Often shopfloor managers reported feeling frustrated that they were given de facto responsibility for the day-to-day running of the restructuring programme, while top management did not provide adequate resources to support the change process. This frustration amongst shopfloor management can lead to the neglect of the implementation programme. Posthuma argues that in the new restructuring management need to take on the role of leaders, not bosses, and often in the sample, this change in social relations did not take place, hindering the process. The importance of appointing a person in the organisation as being responsible for the implementation, a "change agent", was also highlighted (Posthuma, 1995).

14 Smaller firms are likely to have a less complicated organisational structure with fewer managerial layers.

Kaplinsky highlights that in the case of "weakly successful" followers, the obstructionist role of management is particularly evident. An example provided from the Zimbabwe research, is that of a subsidiary of a Transnational Corporation (TNC) where the adoption of JMT's was initiated by the parent company in England. The local management resented the restructuring of the organisation, and claimed to have no funds for restructuring of production cells, while at the same time they upgraded the boardroom complete with a purpose built drinks bar (Kaplinsky, 1995:p. 67).

Kaplinsky points out that in all cases of "failure and regression", management at all levels in the organisation have refused to back the introduction of the new practices. But, even where management is behind the project, evidence suggests that learning new habits is not easy, and the tendency is to revert back to tested procedures. Kaplinsky thus argues that institutional mechanisms need to be established in order to sustain the implementation. Examples are the establishment of stakeholder committees or task forces[15]. In the Zimbabwean example, the consultancy instituted a three tier communication structure in all the firms in which it was involved consisting of a steering committee of senior management, a task force (JPS task force) of production management and quality task forces (QTF) including the direct workforce (Posthuma, 1995 in Kaplinsky, 1995:p. 67). Posthuma's findings indicated that in two thirds of the firms, workers continued to meet regularly in the QTF's and make suggestions for improvement while top management were no longer meeting regularly in the steering committee, and in almost all the implementing firms, task forces stopped functioning at an early stage of implementation. Further, it was found that the degree of adoption of other JMT's was related to the functioning of the quality task forces (Kaplinsky, 1995:p. 67). This highlights the importance of securing participation and co-operation from shopfloor employees for the process.

Kaplinsky argues that there are several factors which affect the quality of management in developing countries including outdated curricula in the business schools, the high degree of family owned enterprises which are reluctant to devolve responsibility to professionally trained outsiders, and an undeveloped training infrastructure. Also, as Fleury highlights (in Kaplinsky, 1995:p. 68), managerial weakness in the developing countries is reflected in the "poor mastery of traditional mass

15 This raises the question of the role of unions who may resist the establishment of structures if they are seen to be bypassing existing union structures. For a country with a strong and independent trade union movement, this would have to be negotiated.

production and this makes it that much more difficult to introduce and sustain the managerial practices of flexible production." In Brazilian firms attempting to introduce JMT's, companies invested in managerial training as part of the restructuring process (Humphrey, 1995b: p.779). Further, the weak SME sector in many developing countries could be a result of managerial weakness which in turn affects the diffusion of JMT's throughout the production chain. Kaplinsky concludes that these factors point out specific LDC factors related to management which affect the systemic adoption of JMT's[16].

4.1.3 Workplace relations:

Kaplinsky suggests that there is no strong evidence to suggest that industrial relations in developing countries is any more of an inhibitor to adoption than it would be in the IAC's. Industrial relations however have developed to reflect specific circumstances in different countries and it is thus difficult to generalise. In some developing countries for instance, the absence of strong trade unions who could resist change, may make them attractive sites for the implementation of JMT's. Humphrey (1995b: p. 773) highlights that poor labour relations in Brazil, and management which have relied on achieving labour flexibility through "hire and fire" policies has produced a "legacy of mistrust", which makes it difficult for managers to gain the active participation of workers in continuous improvement. In two firms in Brazil where management introduced SPC, Posthuma (1991:p. 151 in Humphrey, 1995:p. 773) found that workers were hesitant to point out problems and report defects as they were too entrenched in a culture of blame and punishment. In Japan, the big firms have made use of the small firm sector and subcontracting networks to achieve labour flexibility. In the absence of a developed SME sector in many developing countries this would leave workers vulnerable to dismissal and with relatively little job security.

16 It seems that management obstructionism is not restricted to developing countries. Kenney & Florida (1995:p. 798) provide examples of Japanese plants in American auto sector where it was found that in nearly all plants in the research sample, Japanese managers expressed concerns about the manner in which US managers operate. "At one transplant Japanese executives said that the preformed attitudes and prejudices of US middle managers toward factory workers were a serious problem." and that they were 'polluted' with American management ideology and techniques (Kenney & Florida, 1995:p. 794/8). Differences were also found in relation to Japanese and American managers attitudes to the blue - collar/ white collar divide. Japanese managers would prefer to see less of a distinction, while American managers want to preserve the traditional divide (Kenney & Florida, 1995:p. 800). This problem would probably be even more exaggerated in SA with white management wanting to hold on to their positions of status and privilege, and complicated by racism.

In SA, the legacy of apartheid resulted in conflictual industrial relations and the history of unions refusal to participate in productivity questions could be an obstacle to adoption. Conflictual labour relations in SA, and the impact of apartheid, have resulted in low trust relations between management and labour, with the "us and them" attitude still prevailing in many firms (Smith, 1997). Research conducted as part of the Industrial Strategy Project (ISP) in SA found that the conditions in SA factories are not conducive to securing participation from workers. In terms of organisational structure, the ISP research (Joffe et al, 1995:p. 80) highlights that work practices in SA are rigid. Supervisory control is hierarchical and authoritarian with a racially entrenched division of labour on the shopfloor. Supervision is often strict, highly paid and unskilled. They argue that this division of labour does not motivate management to enhance workers skills and does not motivate workers to acquire skills.

It would thus seem that the poor state of workplace relations in South Africa would need to be addressed if JMT's are to be adopted systemically. Equity employment laws, and laws promoting increased democratisation of the workplace could play a role in this. Other factors which affect the state of workplace relations are addressed below.

4.1.3.1 Wage differentials / workplace inequality:

Other aspects of LDC labour practices such as large wage differentials and job grading systems designed for a high degree of job fragmentation also impose constraints on adoption (Joffe et al, 1994; Black, 1994:p27). This is due to a number of reasons for example, workers feeling that they do not have an equal stake in productivity improvement and will not be adequately rewarded, as well as resistance from artisans to multi-skilling as they try to hold on to their traditionally superior positions. The earning differentials in SA'n manufacturing are very high both within the workforce (between artisan and labourer) and between management and workers. In terms of wage differentials for example, in SA a line manager receives between 10 and 20 times the wage of a production worker. Line managers in Australia or Britain, by contrast, can expect to earn between 1.5 and 2.5 times that of a production worker (Joffe et al, 1994: p. 193).

Racial and gender differences abound and are sources of conflict. The system of collective bargaining, particularly at the plant level, is characterised by adversarialism and as with the skills

profile, is the outcome of the hierarchical and rigid mode of organisation; it also reinforces this work organisation.

Worker participation schemes (green areas, quality circles, suggestion boxes, briefing sessions) enjoy limited success on the shopfloor as they are usually led by supervisors who frequently believe that workers do not have insights to offer. They are often also implemented piecemeal, used to bypass unions, and are usually implemented from above. While there have been examples of improved productivity related to democratic work practices, the diffusion of practices, both at plant and sectoral level, is not happening widely (Joffe et al, 1994: p.193/197).

It is thus evident that these workplace issues and human resource factors could inhibit the implementation of JMT's which could depend on higher degrees of co-operation between management and labour. It is argued thus that either implementation in firms will fail, or they will have to adapt the changes to a low-skill, low-involvement environment, using stand-alone techniques which may limit the systemic adoption of JMT's (Humphrey, 1995b: p. 774).

4.1.3.2 Job Security:

A further impediment to adoption is job security. Workers are likely to be hesitant to participate in improvements if they fear that it might lead to redundancies. Hence, in an environment of labour instability, securing the commitment of labour might prove difficult. Posthuma (1995) highlights that if workers identify job losses with the restructuring programme then they are likely to resist it. She suggests that increased worker flexibility need not lead to job losses, but that the improved performance of the firm could lead to more stable employment. Management in the Zimbabwean firms often ignored the advice of leaders in JMT's that the labour force should be stabilised before the introduction of the programme. Central to the pact between management and labour in the firms in the Brazilian research was labour force stability[17]. However, Humphrey (1995b) suggests that macro economic instability and fluctuations in economic activity and policy changes made this difficult to sustain, even though it was notable that many firms in the study attempted to avoid dismissals. In other countries, such as India, companies attempts to restructure are restricted by employment laws and union agreements which, for example, restrict daily output and labour

17 Interestingly, when labour unions began re-emerge in Brazil in the late 1970's, central to their demands were stability of employment, improved pay and reigning in of the arbitrary powers of supervisors.

flexibility[18]. Firms thus have to negotiate changes with union and labour and Humphrey argues that they have little to offer in terms of benefits as they are restricted in so many ways.

Humphrey (1995b) suggests that in Brazil, poor labour relations have not been as much of an obstacle to the introduction of JMT's as would have been predicted. However, it seems that in an economy with high unemployment and weak legal and union protection for labour, once systems to organise production and monitor performance are in place, management could renege on agreements which were made to gain acceptability for the introduction of JIT/TQM (Humphrey, 1995:p. 783). Humphrey cautions however that this would probably undermine the process of implementing Japanese Manufacturing Techniques.

4.1.3.3 Worker consent:

Worker motivation and participation are two more crucial issues for sustainability. It has been shown that organisations which have involved workers in decision making around the programme, and which asked workers their opinions once the programme had been introduced had higher success rates. Further, tangible improvements (such as a reduction is waste such as scrap) should be linked to tangible benefits, such as a bonus at the months end. Posthuma (1995:p. 114) shows that there was a general weakness in Zimbabwean companies in terms of implementing policies which would motivate the workers. "Harnessing ... enthusiasm would be a fairly easy task in the early days of the program. Cynicism and resignation to the former status quo, however, had settled in over time in cases where no feedback was forthcoming, or where they felt the effort was one-sided" (like when top management stop meeting) (Posthuma, 1995:p. 114). Posthuma highlights the importance of having a realistic view of what motivates employees who have modest wages and little prospects for career advancement. In the event of strong trade union organisation, it is likely that incentives (financial or non-financial) would have to be negotiated. Finding ways to motivate workers to participate in the process is crucial.

At the Ford Hermosillo plant in Mexico social innovations formed part of the success of the implementation. Team work forms part of the philosophy at the plant which stresses worker input for improving performance through Kaizen. Other important features which have contributed to the

18 It is not clear what is meant by labour flexibility in this instance. It could either refer to greater flexibility in hiring and firing, working hours and shift systems or multi - skilling & multi - tasking.

successful implementation of work organisation are the flat hierarchy of skill categories, and multi-skilling which allows for greater flexibility for job rotation (Shaiken, 1990:p. 25; Black, 1994:p. 27).

It becomes clear from the empirical evidence that implementing technical changes without the accompanying social incentives is not likely to be sustainable. As discussed earlier, firms in countries besides Japan have to find ways to replace the 'three treasures' of Japanese management in order to gain compliance from the workforce (Humphrey, 1995b; Posthuma, 1995). Thus the neglect of human resource development, education and training, and other social innovations "i.e. treating organizational restructuring instead as merely the introduction of a set of technical solutions - poses limits to the viable and sustainable diffusion of new organizational practices in LDC's." (Posthuma, 1995:p. 106).

4.1.4 Interfirm co-operation:

Humphrey (1995a: p. 160) argues that the spread and depth of diffusion of JMT's is likely to be greater if firms have closer relationships and are able to learn from one another. Further, the competitiveness of clusters is likely to be bolstered by the restructuring of large firms which would act as a catalyst for change within the cluster as a whole. As discussed in Chapter Two, the relationship between firms in a cluster or pipeline need to be more co-operative in a flexible production system because of the need for reliable delivery of quality products, product development ("simultaneous engineering") and JIT delivery (optimally supplier firms also need to adopt JIT production as there is no point in the holding of inventory being pushed downstream). Kaplinsky argues that these changes in inter-firm relations are often difficult to achieve. Two firms in the UK auto industry have noted that the systemic implementation of JMT's in their firms has been held up by suppliers (Oliver et al, 1983 in Kaplinsky, 1995:p. 65).

At a large carton and board manufacturer in Zimbabwe, the systemic adoption of JMT's was significantly hindered by deliveries of poor quality paper, often still wet and of inconsistent sizes. This same firm was expected to deliver shoe boxes to a shoe company on a JIT basis. This they were achieving by building up stocks of finished goods which it then delivered on a JIT basis. In the Escort plant in India, in 1987/88 more than 50% of the sheet metal deliveries for motorcycles were defective (Kaplinsky, 1995:p. 66).

4.1.4.1 Weak SME sector:

This problem seems to be exaggerated in developing countries considering the weakness of the SME sector, which has caused a higher vertical integration of firms than is desired, even in mass production. The contribution of manufacturing SME's to industrial economic activity in SA is relatively small with only about 24% of formal industrial employment created by small enterprises with less than 100 employees. It is estimated that less than 5% of manufacturing enterprises are black owned (BuDS, 1995). In the Government White paper it is estimated that there are more than 800,000 small, medium and micro-enterprises in the country, absorbing about a quarter of the labour force of 15 million people. This is in addition to about 3,5 million people involved in some or other type of survivalist enterprise activities. In comparison, over 99% of Japan's businesses are small, and small businesses contribute more than 80% of total employment (Chushokigyo, 1982 in Motoko Yasuda Lee and Charles Mulford (JSBM, July 1990:p. 62).

4.1.4.2 Poor physical infrastructure:

Poor physical infrastructure of developing countries is particularly problematic when it comes to JIT deliveries, this includes; delays at ports, poor transport systems, and under-developed "infostructure" (for Electronic Data Interchange for instance). The experience of the Hermosillo plant in Mexico indicates that some factors typical of developing countries did place challenges in the way of achieving higher performance. The low number of suppliers of maintenance parts contributes to machine down times. Further, the plant operates on a JIT basis, and thus requires a fairly developed supplier sector. As this is absent, it has to rely on parts shipped from Japan. While a unique system of collating parts in Japan in daily production packs which are then shipped to Mexico has been developed, internal infrastructural and transportation problems still effect the smooth operation of the system (Shaiken, 1990:p. 25). Another related problem of this arrangement is the long supply lines which lead to long lead times. Material orders are made six months in advance to the supplier in Japan, and as the supplier order becomes locked in for four months, it leaves little flexibility for changing the model and option mix. The potential however exists for developing backward industrial linkages, and thus for developing the local component suppliers (Shaiken, 1990:p. 40/1).

5. Findings:

The focus of this chapter has been an examination of the factors specific to developing countries which could inhibit the systemic adoption of JMT's.

It seems from the above discussion that there are factors prevalent in developing countries which do inhibit the systemic implementation of JMT's, such as the low education level of the workforce, poor management capability, high wage differentials, low-trust labour relations, outdated training programmes, poor infrastructure and an underdeveloped SME sector. Kaplinsky (1995) argues that these factors can be overcome if governments adopts specific policy measures to address these constraints. Investments in education and training, infrastructure and bolstering the SME sector are important in this regard. Kaplinsky thus concludes that with considerable effort the "systemic gap" can be overcome[19].

It seems to me however, that this might only be true for leading enterprises. As Fleury comments on the restructuring efforts of firms in Brazil; "The new competition poses enormous challenges for every participant in the productive system. The greatest seems to be the urgent need to break away from long-lived and deep-rooted habits and conceptions. At the firm level, competitiveness requires a reappraisal of both technology and manufacturing and their role in competitive strategy. This can bring a profound change in the values and structures of power, which in turn will demand greater investment in time and resources. *Until now, only leading companies have been able to carry out these changes, with relative success.*" (Fleury, 1995:p. 84; my emphasis).

An examination of the issues involved in restructuring the operations of firms in developing countries, seems to suggest that a rapid diffusion scenario is not likely. The non-systemic adoption of firms in these countries is likely to mean that less firms are likely to succeed, and that the techniques could be adapted to a low skill, low involvement environment, slowing down the process of diffusion. If we recall some of the questions upon which an analysis of diffusion is based according to Humphrey (as outlined in Chapter Two), it becomes evident that the mostly likely scenario is that of uneven diffusion. These questions are addressed below.

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19 It is important to bear in mind that the research on JMT implementation in LDC's is limited, and hence it is difficult to draw conclusions from the small group of case studies, and also that diffusion is at an early stage, making predictions difficult.

Firstly, competitive pressure is not conclusively a good catalyst for the adoption of the new production methods. While competitive pressures are increasing in developing countries, it does not mean that firms will automatically choose Japanese Production Techniques. Also, macro-economic instability and the failure of governments to address supply side measures which would support firms competitive efforts, can hamper the development of competitive strategies at sectoral and firm level. The important role of fulfilling basic needs including housing and education has also been highlighted.

Secondly, JMT's are not the only and best way to meet competitive pressures amongst a range of industries and firms. Meyer-Stamer (1995) argues that we should be cautious about placing too much faith in the reorganisation of production for achieving competitiveness. He highlights that "an efficient production organization is a necessary, but far from a sufficient condition for competitiveness." (1995:p. 144). Further, he shows that while Brazilian firms often made rapid improvements in production, they still were a long way off from world class manufacturing standards. For instance, advances were made in reducing the reject rate from 20,000 parts per million (ppm) to 3,000 ppm, yet the World Class Manufacturing standard is 200 ppm (Sequeira, 1990:p. 35 in Meyer-Stamer, 1995:p. 145).

In terms of the diffusion and trajectory of JMT's Meyer-Stamer highlights that "Brazilian industry is late in setting out to catch a train already travelling at breakneck speed." (1995:p. 145). He concludes that "[I]t might be assumed that the introduction of new organisational concepts represents a step in the right direction, but it is impossible to say if this will prove sufficient. So far empirical data do not support this notion." (Meyer-Stamer, 1995:p. 146). There are clearly different paths to competitiveness, such as the Chinese entrepreneurial model (Meyer-Stamer, 1995:p. 147), and firms should probably choose the most suited production method to achieve their competitive strategy based on the factor conditions in the country in which they operate. Further, management in developing countries may not have access to the information about which techniques are best suited for their enterprises and this could affect the systemic adoption of the techniques.

Thirdly, evidence presented thus far also indicates that *the systems are not easy to introduce and do require fundamental changes in the organisation of production and social relations in the firm, and certain technical capabilities.* The techniques require a fundamental paradigm and organisational shift which is not easy to achieve and all the factors are not within the control of management (Humphrey, 1995a: p. 154). Firms may make progress towards the systemic adoption of the new manufacturing techniques, but change will be "long and painful" (Humphrey, 1995a: p. 154). The adoption requires so many related modifications, including both social and technical changes, changes in accounting and in perceptions related to competition and co-operation, that it might be overwhelming for a firm. Sustaining the changes requires dedication from management and many firms fail to move beyond the initial phases of implementation. The process of change poses great challenges for firms and is quite complex (Fleury, 1995:p. 82). Further, the tendency to revert back to known methods is quite high and learning new habits is not easy (Bessant & Caffyn, 1996). Kenny & Florida (1995:p. 800) suggest that once a factory culture is established, it is more difficult to change to a new style of management, as opposed to implementing the techniques in a greenfield site.

Fourthly, evidence also seems to suggest that *the systems do not need to be implemented as a whole system, and even tools used in isolation will bring results, and the degree of change required in the firm and the difficulty of implementation increases as the use of the methods become more systemic.* There are clearly benefits to be made by implementing specific techniques, but as Kaplinsky argues it is not likely that the improvements will be sustainable. For many firms implementing the initial technique may prove too much, and due to the difficulties of sustaining the initiative, may not progress to a more systemic approach. Conversely, if management do not view the techniques as systemic, and they see benefits from using single techniques, they may be less inclined to continue with the adoption of other techniques. The result of the both of these scenarios "... would be that many firms would adopt some limited elements of JIT/TQM, but the systemic adopters would be much rarer. The forces pushing the limited adopters in the systemic direction would be weak, and offset by the barriers to systemic adoption. At the very least, extensive institutional support would be needed to ensure widespread diffusion of systemic JIT/TQM." (Humphrey, 1995a: p. 155).

Fifthly, some products can be made competitively without the systemic adoption of the new production methods. This point is important since the choice of production technique should

depend on the firms strategic position. The importance of firm strategy should thus not be forgotten. For both Ford and Toyota, the systems developed were in line with the markets which they were trying to exploit. Hence, just like the principles of Fordist production management were diffused while the principle of searching for consistency between the organisation of production and the competitive strategy of the firm were not, the same danger exists with Toyotism (Best, 1990). Thus, it is not necessarily true that every firm should adopt JMT's, but they should adopt the best methods for their production and market characteristics. A firm producing undifferentiated commodities for an undemanding mass market, may be better off producing in a mass way. However, the search to reduce waste could still be relevant.

Lastly, if one firm adopts the new production methods it will have to redefine its relations with other firms. For firms adopting JIT methods, redefining relations with other firms could be essential. Developing closer relations with suppliers and co-operating in terms of product design and reliable delivery of defect free goods will require close co-operation between firms. Humphrey (1995a) argues that in order to survive firms will need to restructure both internally and externally, and that this process will be made easier if firms operate within networks of clusters where they are able to learn from one another. This has implications for the trajectories of change. On the one hand it is argued that the spread and depth of diffusion is increased by greater inter -firm co-operation, and on the other competitiveness is likely to increase when the large firms restructure internally and thus improve the competitiveness of the cluster as a whole. The weakness of the small and medium sized sector in developing countries, could be an impediment in this process.

6. Conclusion:

It seems that the implications of this discussion of transfer and diffusion in developing countries, are that caution is required when reading a universalist account of the model of Japanese management. Looking to the "Eastern Archetype" may be a misnomer, since the techniques do not exist in isolation from social contexts, they are not value free, and are not easily assimilated and adapted. Neither are they necessarily the best choice of technique for a particular firm. We are able to conclude from the above that it can not be assumed that firms faced with competitive pressures will turn to JMT's as a solution, that JMT's are not the only way to meet the competition, that adoption is not easy, that there are impediments to systemic adoption in developing countries and that changes in relationships with other firms would be necessary. Firms would be required to invest considerably

in training, and in changing workplace relations, which for some firms may be expecting too much. It seems thus that the diffusion of JMT's in developing countries is likely to remain uneven, with certain sectors moving ahead faster than others, and leading firms with resources being the first adopters.

Having examined the empirical evidence from the literature regarding the diffusion of Japanese Manufacturing Techniques to firms in developing countries, the following chapter captures the results of the field research and explores the issues which arose out of implementation experiences in SA'n plants.

Chapter Four: Empirical research of implementation experiences in SA'n enterprises:

1. Introduction:

In the previous Chapter, the factors which influence the diffusion of Japanese Manufacturing Techniques (JMT's) to manufacturing enterprises in developing countries were explored. The aim of this chapter is to investigate issues which might impact on the most likely possible path of the diffusion of Japanese Manufacturing Techniques in South Africa. This is achieved by examining empirical evidence in South African plants, which was gathered in the process of following up the implementation experiences of teams which participated in the Best Practice Initiative (BPI) training workshops of the Manufacturing Roundtable (MRT). The level of the firm is the area of investigation.

In order to inform the discussion about the implementation experiences, it is important to understand what was taught on the workshops. **Part I** of this chapter thus defines 5S and Visual Management which are the specific Japanese production techniques which were covered on the workshop. This is followed by a brief look at the effectiveness of the training and what participants understood from the training. It is necessary to establish this as it also impacts on post-workshop implementation.

Part II is an examination of the issues which arose in the post-workshop implementation process. The focus is on highlighting the factors which could impact on the systemic adoption of Japanese Manufacturing Techniques, which in turn affects the path of diffusion. The factors identified in Chapter Three provide a guideline for an analysis of the field research. Issues examined here include the degree to which companies view the techniques as systemic, and other factors which impact on systemic adoption including human resource factors, the role of management and the state of workplace relations. It is argued that critical to successful adoption is the recognition that the changes require both technical and social innovations.

PART I

2. Shopfloor Best Practice Training workshops[1] :

Three Shopfloor Best Practice Workshops were held in 1996 and were attended by 72 people from 17 different companies. Participants were drawn from 18 different plants, two head offices, and one management consultancy. Companies were invited to send teams consisting mainly of shopfloor workers. The participants came mainly from the shopfloor, 69% were either shopfloor workers, supervisors or maintenance technicians. The rest of the participants were made up of support personnel including continuous improvement managers, projects managers, trainers or engineers.

The companies spanned 9 different industrial sectors, and included both continuous and assembly processes. The largest group was drawn from the food and beverage sector. Most of the participating plants were medium or large enterprises with more than 100 employees. The motivations for participating in the workshop were on the whole to support change initiatives in the companies and to bring shopfloor workers into the process. The motivations seem to be closely related to the desire to create an attitude change towards increased responsibility and involvement from the shopfloor.

The intention of the BPI was that the participating teams would return to their plants and act as catalysts for change from within the organisation. The post-workshop implementation experiences were then documented in order to determine the factors affecting implementation in plants in South Africa. Fifteen of these plants participated in the follow up research.

Perhaps it was an unrealistic expectation that shopfloor people alone would be able to affect change in the organisation. The research designed by the MRT in the form of the BPI was intended to provide clues as to how Japanese Manufacturing Techniques could best be 'indigenised', i.e. adapted to South African situations. The intention was to diffuse Shopfloor Best Practice to the participating plants and to learn from their experiences. One needs to question whether the action research devised by the MRT was the best way to diffuse these practices[2]. A number of factors affected the

[1] For a more thourough description of the Best Practice Initaitive workshops and exploration of the research methodlology the reader is refered to the Methodology section in the introduction.
[2] The question of whether this is an appropriate research design for a study of diffusion is considered in the Methodology section of the introduction under the heading "f. vailidity".

effectiveness of the dissemination of these practices to the plants involved. Firstly, there was no selection criteria for participating firms, and as such the firms represented a broad spectrum of the stages of JMT implementation. For example, eight of the plants were only in their first year of implementation, while others had been implementing change programmes for some years. Some plants participated in the workshops as their first introduction to Japanese Manufacturing Practices and were not prepared for implementation. The experiences of the participating teams were thus varied, and the issues which they faced vastly different. *Secondly*, the expectations of the managers which booked the participants in on the workshop played a central role in what occurred following the workshop. The managers were not co-opted into the research process and some had other motivations for participating besides dissemination of the actual techniques such as the desire to change participants attitudes.

Also, while the invitation highlighted that the workshop focused on team based problem solving for shopfloor workers, and recommended that companies send a team of at least three people made up primarily of shopfloor people together with a mentor, the companies final choice of participants did not affect their acceptance into the training, and some companies sent only one person[3]. The composition of the participating team influenced their ability to act as disseminators. Participant teams which were multi-functional seemed to be most effective in this regard. Further, the MRT did not intervene in the implementation process, and offered no follow up support besides the newsletter which was aimed at exchanging ideas between participants and at sharing implementation experiences. As such it could have been an unrealistic assumption to expect any change to be affected by participation in one workshop. These factors themselves are however interesting findings, and are important lessons for designing future research or dissemination programmes.

The follow up research did however reveal examples of the issues which arise in the process of the adoption of JMT's and can provide pointers as to the factors which could impede or support the adoption process and hence the path of diffusion.

The Best Practice Workshops were modelled on the idea of Jishuken teams, with the emphasis on 'learning by doing'. The word 'Jishuken' means 'by myself, investigate', and Mr Furuhashi[4]

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[3] Logistical considerations also played a role, and careful selection of the participating companies was inhibited by the need to recoup the costs of the workshop by full attendance.

[4] Mr Furuhashi is a Japanese Manufacturing Consultant from the Japanese Industry Association, Chu-San-Ren in Nagoya. He both planned and facilitated two of the workshops held in 1996. The workshops were partly sponsored by the Association for Overseas Technical Scholarship (AOTS) in Japan.

explained it's understanding in the context of the Toyota Production System as meaning 'Out of gratitude for the opportunity afforded the course participants to learn in such a real classroom, the participants "volunteer" improvement suggestions.' (Faull, Lomofsky, Grütter, 1997). Jishuken teams are multi-functional project teams made up usually of about six members including two production people, an industrial engineer, a process engineer, a material control representative, and a person from plan engineering or another related department (Toyota South Africa Document (TSA)[5], 1985 in Faull et al, 1997). The teams are established to tackle specific projects, following set procedures including making a presentation to management of the project and the proposed improvements. Once approved, the team has the responsibility of overseeing the implementation of the improvements (Faull et al, 1997).

The workshop which ran for five days, was designed to give participants the experience of a Jishuken type process, and real factories were used as learning laboratories. The first few days were used to impart the basic principles of Japanese Manufacturing Management. Teaching methods included frontal learning using overhead slides and promotional videos of implementation in Japanese and Singaporese factories. This was followed by a two day field practice where teams were given specific problems to tackle on the shopfloor of the host company. Following the field practice the teams made presentations to people from the host company on their suggestions for improvement. The specific Japanese production methods which were transferred on the workshop were 5S and Visual Management, which are defined below.

2.1 Defining the New Production Systems at shopfloor enterprise level - the Best Practices taught on the BPI:

The aim of this section is to describe the particular application of Japanese Manufacturing Practice which was transferred on the workshop. The terms of reference for the empirical data presented in this chapter are thus defined. The BPI focused mainly on training shopfloor workers in the 5S system which is described in detail by Osada (1993).

[5] TSA insituted the approach in 1985. In TSA the groups were targeted at a more junior level than those in Japan. (Faull et al, 1997).

2.1.1 5S & Visual Management:

The explanation of the 5S system and visual management provided below is drawn from the course materials in order present a view similar to that which the participants received.

As discussed in ChapterTwo, many packaged programmes referred to in BPI workshops as 'Kaizen Capsules', have been developed. These include programmes such as Total Quality Management (TQM), Total Productivity Maintenance (TPM), Just-In-Time (JIT) and so on. The focus of the workshop is on the 5S system and Visual Management (VM) for control of operations. It is suggested that VM and 5S are the basic building blocks for any improvement programme, and should form part of any Kaizen Capsule (Furuhashi, 1996: BPI Workshop). This is because, as discussed in Chapter Two, improvement can only really begin once the production process is brought under control. 5S and Visual Management are the techniques used to achieve normalisation in production by eliminating the special causes of variation, which then exposes the real problems underlying production. 5S thus attacks uncertainty and exposes problems, and Visual Management is an effective feedback system (Lomofsky, D; Faull, N & Grütter, A, 1997:p. 5). 5S is a system which is based on simple housekeeping with underlying principals of productive planning, maintenance, health and safety, and it is suggested that it is a good system for engaging shopfloor workers in team based continuous improvement.

According to Takashi Osada (1991:p. 2) the 5S's are intended to eliminate waste (p. 25). The 5S system highlights that waste is a problem and that often waste accumulates by itself and affects the morale of workers and their health and safety. 5S is a way for production workers to begin to understand the principles of production management as they learn by doing. They begin to take responsibility for the process, to improve the level of operations and improve the quality assurance level[6]. 5S forms the basis of preventative maintenance, quality at source, right first time and root cause analysis. It is argued that they are the stepping stones to the successful adoption of any other techniques. Recognising that humans are fallible and make mistakes, the 5S system is supposedly a way of creating fool proof procedures. 5S needs constant attention, even the smallest of problem

[6] quality assurance means quality at source ie: getting it right the first time, as opposed to quality control which is conducted after production and leads to built in waste. Total Quality Control is a quality assurance system.

areas needs to be considered and only a little at a time can be achieved. They are said to be a means of creating good habits through constant practice.

5S & Visual Management are systems to be designed and implemented on the shopfloor and by the people on the shopfloor, supported by management through a commitment to training, time, funding and to providing the channels through which suggestions for improvement can be made and followed up.

The purpose of the 5S's are safety, efficiency, quality and maintenance.

Osada argues that the 5S's are the first indicator of how well things are going in the factory. If they are not being implemented it could indicate that quality and shopfloor relations are problematic (ibid:p. 4).

Overview of the 5S's: [7]

Action	Principle
Organisation (Seiri)	1. Stratification Management - Classifying the necessary from unnecessary & arranging accordingly 2. Treating the Causes
Neatness (Seiton)	1. Functional Layout 2. Efficiency
Cleaning (Seiso)	1. To Clean is to Inspect 2. Elimination of Breakdowns
Standardisation (Seiketsu)	1. Visual Management 2. Colour Management 3. Best Operating Practice
Discipline (Shitsuke)	1. Planning 2. Preparation 3. Training

Organising - Seiri: The two principles of organisingare stratification management and dealing with problems at their source[8]. Stratification management involves first deciding how important something is and getting rid of the unnecessary, followed by classifying what is left over according to

[7] for a detailed chart see Osada, 1991:p. 34 -37 See Appendix Four

[8] Seiri is translated as 'clearing up' in the videos used in the training.

frequency of use, and making sure that that everything is in its proper place. Organising the operation for clearing up should be treated in a serious manner and be designed and implemented in teams. It should be recognised that clearing up is in itself a process of continuous improvement. People will also need to be trained to distinguish the necessary from the unnecessary and will probably need to be assisted in planning and in using problem identification and solving methods such as the 5W's and 1H (Who, What, Where, When, Why and How) and Pareto Diagrams. Should a problem arise which the team can not solve, a cross functional team should be formed to solve the problem.

Problems which need to be dealt with at source include finding the reasons why machines are dripping oil, and tracing the leak back to its source. This includes cleaning areas which have accumulated so much grime that it is difficult to see for instance, if a machine is salvageable or not.

Equipment may have to be redesigned to make it easier to keep the factory clean. Pipes for instance may need to be extended to drains instead of dripping on the floor, gadgets can be designed to accumulate shavings rather than having them fall all over the floor. In effect, this means eliminating places that are hard to clean and creating systems for cleaning at source (ibid:p. 67).

Neatness - Seiton: Having got rid of the unnecessary, the next step is to organise what is necessary. Having things in their right places in an ordered fashion (perhaps according to frequency of use) so that things can be accessed in a hurry. The emphasis here is on functional management and reducing time wasted due to searches. "Neatness is a study in efficiency." (Ibid:p. 74). For instance, when operating small-lot production with quick turnaround times, time saved on looking for tools and parts could be critical. Teams thus have to decide how the tools and equipment which they use should best be stored. Frequently used items should be near the machine for instance.

When designing storage, it is important that names for items are standardised (i.e. everyone uses the same word for each gadget.) At the end of this step everything should have a name and a location. Part of this is inventory management, ensuring that the line will not run out of critical inputs. Also, different oils should be clearly marked so that the wrong oil does not end up in the wrong machine (ibid:p. 105). Safety and quality should also be considered when designing storage.

Cleaning - Seiso: The message here is that the essence of cleaning is careful checking and inspection (ibid:p. 116). This is an important step in preventative maintenance.

There are three levels of cleaning: *macrolevel activity* where everything is cleaned and sources of dirt are tracked down; *individual level* dealing with specific workplaces and machinery; and lastly the *micro-level*, where the specific parts and tools are cleaned (ibid:p. 116). Osada stresses the personal responsibility which comes with cleaning. He argues that teams and individuals should define their responsibility areas as this helps establish a commitment to the process (ibid: p.119).

Osada also suggests that time should be set aside each day for individual and micro-level cleaning activities. This can be three minutes or 5 minutes at the start and end of each shift and Osada stresses that it is important that everybody take part in the activities at the same time. This reinforces team work and co-operation. There could also be two half hour sessions monthly and five minute clean ups daily. What is important is that the routine is regular and adhered to (ibid:p. 125).

Cleaning too needs to be accompanied by training. It is likely that people will have to learn the functions and structures of the equipment and understand the mechanisms involved in order to properly conduct their cleaning operations. In order to inspect when cleaning, operators will need to understand for instance how the lubrication system works, which way the oil flows in order to check where leaks could be coming from. Visual tools can be used for this e.g. arrows indicating the direction of flow could be stuck on to the pipes.

Cleanliness too is crucial for safety and quality. Slippery floors can be dangerous, as can loose wiring. A machine which is not functioning properly is likely to produce defected products. Also maintaining the equipment in good working order is likely to lead to lower machine downtimes (ibid:p. 135).

Standardising - Seiketsu: This involves the maintenance of a clean orderly working environment. A clear system must be developed to recognise when abnormalities occur. It is critical that anyone in the area is able to spot and react to malfunctions as quickly as possible. Visual Management is a tool used to maintain standard conditions.

Visual controls can be applied to safety management and equipment maintenance. Some examples of areas where visual control displays are needed include; displays to help people avoid making operating errors, alerting danger, indicating where items should be stored, cautions and operating reminders and preventative maintenance displays (ibid:p. 141). For instance, pressure gauges should be easily visible and it should be quick and easy to detect any changes in the pressure. Lights could indicate when an angle grinder is operational (ibid: p148/153).

Osada argues that if people are required to follow rules, the rules should be easy to follow by making them visual (ibid:p. 139).

Osada highlights that standardisation is critical to ensure that everyone is doing the same things in the same way, eliminating special causes of variation.

Shitsuke - Discipline. It is recognised that it is never easy to stick to all these things. Step 5 is thus designed to encourage people to stick to the disciplines inherent in all 5 steps of 5S. It could also be translated as diligence. Visual instructions might be the best way to communicate the rules to be followed. Workers need to be involved in the production of standard documents and check sheets. Correct training techniques are vital. Workers should be able to train themselves by reading standard documents. In some factories six month goals for each worker are shown on a visual display so that each worker is aware of each other worker's goals. It is considered important that people set their own targets, and then develop habits which they will never forget. Not only does the equipment need to be foolproofed, but so do the procedures (ibid:p. 157 - 167). Osada claims that discipline demands that, "... each persons responsibilities be clearly defined, people be given practice in fulfilling responsibilities, people be mathematically literate." (ibid:p. 167). This again highlights the importance of basic education if workers are to understand the measurements taken as part of production. According to Mr Furuhashi (BPI Workshop, Jan '96) Shitsuke is not about blaming and disciplining in the hierarchical sense of the word. It is about improving ones own habits as the foundations for making work and life easier, safer and more enjoyable.

Summary of 5S's:

Osada argues that the basis of the 5S's are practice, practice, practice. In this way the rules eventually become internalised and new habits develop which enable workers to manage their "own work responsibly" (ibid:p. 143). Constant repetition, he warns, is the only way to avoid backsliding

(ibid:p. 155). Training in the philosophy and background to CI is probably only likely to become entrenched if it is supported by actual practices on the ground. 5S extends beyond housekeeping into other areas such as inventory management, preventative maintenance, standard operating procedures and is thus considered to be a good starting point for future systemic adoption. The 5S system involves team work and significantly requires high involvement from shopfloor workers. According to Japanese wisdom, *if you can't get 5S right, you won't get anything right*.

2.2 Participants understanding and experience of the training:

In this section I highlight what the participants learnt from the training. It is important to understand what the participants took back with them to their plants in order to understand the implementation experiences following the training. The degree of implementation does depend to some extent on the effectiveness of the training itself. Research into the effectiveness of the training was conducted by the Faull, Lomofsky & Grütter (1997). The effectiveness research found that the participants returned to their plants motivated to make improvements in their workplaces, and that they were equipped with the basic knowledge and skills to do so. Much however depended on the construction of the participating team, the support which they received from management, additional training which they were offered and the state of workplace relations in the plant. These findings are presented briefly below.

2.2.1 Effectiveness of the training:

The field research shows that the participants returned to their workplaces following the workshop prepared and motivated to embark on improvement projects. They indicated that they left the workshop with a basic understanding of the principles of Japanese production management, including the philosophy of continuous improvement or Kaizen. The participants also received a vision of what can be achieved through the use of videos showing successful change initiatives in Japanese and Singaporese plants, and were given a chance to participate in team based problem solving exercises on the shopfloor of a working factory. The participant teams were encouraged throughout the workshop to think about how they could apply what they had learnt in their factories on their return. The workshop thus provides the participants with:

- an introduction to the principles of Japanese production management
- a vision of what can be accomplished by seeing real examples in the videos
- the practical experience of problem solving and team work through the field practice.

For many participants the workshop represented a significant shift in terms of being prepared to take responsibility for improvements around their own work. They reported gaining a better understanding of the nature of global competition; a broader overview of how business operates; and a greater sense of the role which they play in the success of the business.

2.2.2 Effect of the workshop on the participants attitude to their work:

When asked whether they had noticed any changes in the way that they viewed their work, the largest group of respondents relate an increased sense of responsibility toward their own work. The responses also indicate that participants have a greater sense of their own worth in the workplace, that they feel more confident, that they have improved their communication and leadership skills and that they regard it as important that workers be involved in decisions regarding their own work. These factors indicate a change in attitude towards being involved in shopfloor improvements.

A comment from one of the participants which illustrates this is:

> *"After the BPI we also said we would get involved. Before it we always asked "for what?" The BPI changed that, I feel more important, and want to be involved and do something extra, can get something from company. I knew that they sent me, and I wanted to show the Production Manageress that I could do something. Tried to get more involved in a workshop and started to like it, now I love it. When we come here with the old machine, they will see that we will be faster, even though they have a new machine."*

This change in attitude was not only reserved for participants drawn from the shopfloor, as one project manager commented:

> *"I learnt to regard the shopfloor as an asset. Before I used to think that workers were just there to do what they were told. Before the workshop I thought that I had more knowledge than the workers, but now I realise that they know their jobs, they have the solutions."*

2.2.3 The value which the participants attached to the training:

As an indication of the value which the participants themselves attached to the training, when asked whether they would advise the DTI to offer similar training for shopfloor workers, of the 48 participants who responded to this question only one did not believe that the training would have any

positive effect. The other responses were split almost equally between those who unconditionally supported the idea, and those who made qualifying statements. The qualifiers included recommendations such as the need to offer the training in the vernacular, to improve the technical skills of the workforce and the interviewees highlighted that the training would be lost if the companies were not prepared to utilise the skills acquired and to provide adequate recognition and reward for participation.

In the evaluations of the first and third workshops conducted by the participants on the last day of the training, 40 of the 44 respondents indicated that they thought the program should be repeated. In all cases the participants found the workshop to be satisfactory, 21 responded that they thought the workshop benefited them professionally to a high extent. It seems thus that the BPI workshop was a positive experience for a majority of the participants.

It is evident from the interviews that the training was effective in exposing participants to the new production concepts, creating an awareness of increased responsibility, team work, problem solving, waste management and customer orientation. On the whole participants returned to their plants motivated and enthusiastic about getting involved in improvement projects. Their experiences on return to their respective plants and the issues involved in post workshop implementation are examined in Part II below

The process of post workshop implementation throws up interesting issues with regard to the factors which enable or inhibit diffusion of JMT's to SA'n plants.

PART II

3. Lessons from post - workshop implementation for a study of diffusion:

3.1 Introduction:

A distinction can be drawn between implementation at plant level and diffusion across industry. It is assumed that by looking at implementation experiences in plants, we can learn about the issues which may effect the diffusion of JMT's to manufacturing enterprises generally. By examining the results of the research session following the first workshop and the interviews with participants and managers involved in the BPI regarding post workshop implementation, the factors affecting the

transfer of Japanese Shopfloor Practices to some plants in SA should become apparent. The implementation experiences of participating companies highlights, for example, the factors which may inhibit the systemic adoption of JMT's. While the sample can not be said to be representative of companies in SA generally, it does provide significant pointers to the key issues involved and may provide some indication of the pattern of diffusion of JMT's in SA.

A number of questions were highlighted in Chapter One which underpin the question of the path of diffusion. The primary question investigated here is the nature of systemic adoption in the plants. My view is that even techniques used in isolation will bring short term results, but without systemic adoption the results will not be sustainable. I concluded in Chapter Three that from existing evidence it seems as if uneven diffusion in Developing Countries is the most likely scenario. Looking at the experiences of the plants in this sample it would seem as if the most likely scenario for SA is also one of uneven diffusion of JMT's.

3.2 Post workshop implementation:

There are many factors which influence implementation and each plant has it's own characteristics and nuances, as does each participant. There is as much diversity evident in this research as there are common factors. So much texture is lost in the summation of this research, yet the strength also lies in the common messages which emerge from it. The sample size is too small to permit rigour in the analysis of the data. However, in that virtually all the plants that participated in the follow-up research, and nearly 70% of the participants were interviewed, some general observations can be drawn.

In the report into the impact of the workshop on the participating companies (Lomofsky, Faull and Grütter, 1997) the following general observations emerged regarding the value which the firm was able to extract from the training:

In those plants which had no improvement program and no expectations of the training, there was little or no implementation. Those plants which didn't have an advanced improvement program, but had clear goals and expectations regarding the training benefited from participation. Participants from plants which were developing improvement programs, or a culture of involvement, were able to use what they learnt in their work, even if the plant had no specific objectives regarding the training. Where a culture of involvement had not been developed, it was rare that shopfloor workers felt empowered enough to initiate a project on their own. Some were afraid of being seen as crossing

the floor, or did not feel that they had the right to tell their colleagues what to do (e.g. plants A & I). In these cases participants report taking individual initiatives such as reorganising their own tool boxes, clearing out their work cupboards or being more aware of safety concerns.

In terms of being able to extract maximum value from participating in training such as the BPI, the composition of the participating team emerged as important. Most implementation occurred when the participating team was drawn from one division, as they could work together and support one another. It was also important that there was more than one person on the workshop from each department. Teams which were thus made up of workers and supervisors and / or a Head of Production seemed to be the best combination for post workshop implementation. This is not true in all cases, but generally it seemed to be the case. Supervisory level participants are able to implement more of their own initiative than operators.

The plants which benefited the most from the training were those which gave the participants an early chance to report back to management and their colleagues, and which encouraged the participants to demonstrate in their own work what they had learnt soon after their return. Having looked at questions concerning the effectiveness of the training, I now turn to the question of the depth of adoption in the participating firms, and the factors which arose in the process of the diffusion of what the participants had learnt on the workshops.

3.3 The extent to which the paradigm is seen as Systemic:

As highlighted in the previous chapter, the extent to which the paradigm is seen as systemic also affects diffusion. It is argued that if companies do not adopt a systemic view it is likely that they will implement the techniques of Japanese Manufacturing as stand-alone techniques. As suggested in Chapter Three this may mean that the improvements made will not be sustainable and that those plants will remain at the bottom end of the 'systemic gap'.

There was no criterion established for participation in the BPI and thus companies with different enabling environments participated. Because the largest group of the participating plants were in their first year of implementation or were only embarking on a restructuring exercise, it is difficult to ascertain the level of systemic adoption in the plants. None of the companies in the sample had moved beyond the second stage of CI implementation identified by Bessant & Caffyn (1996).

Joffe et al (1995:p. 211) suggest that often management in SA treat the introduction of change programmes such as TQM as "...a 'smorgasbord', taking only what appeals to management and ignoring the rest - most often the meaningful training programmes or real attempts at union consultation."

An understanding of the systemic nature of the techniques varies between plants in the sample. The participating plants which want to embark on change programmes can be broadly split into two groups, those which either have an implementation plan, or are working with consultants or have a adopted known methods such as TPM and TQM (or any combination of the three). The second group of plants seem to be starting with a single technique, such as the introduction of teams, and seeing where this leads them. They do not seem to have a clear picture of what techniques they need to use to bring their manufacturing strategy in line with their competitive strategy. While every implementation process is likely to start with the introduction of one technique to address immediate concerns, the key difference between these two groups is that the former has a direction for their change programmes. This is probably more likely to lead to systemic adoption. The degree to which the techniques are seen as systemic thus differs between plants in the sample. The indicators of the companies approaches to systemic adoption are discussed below.

3.3.1 Indicators of systemic adoption:

3.3.1.1 5S implementation:

The implementation of the 5S system can be used as an example for examining the process and issues involved in systemic adoption. Attempts have been made at the adoption of the 5S system in some of the plants which attended the workshop. Each plant displays differing degrees of adoption. While some have understood the underlying principles and are implementing each of the steps systematically, others are going through the actions without the accompanying principles using it as a superficial housekeeping system, or are only embarking on one of the stages e.g. cleaning. Even the non -systemic use of techniques had beneficial results including improved morale and better organisation.

The example of the Pilot line from Plant A is the best example of systemic implementation arising from the workshop. One person from the pilot line, as well as the Project Manager, Production Manager and a supervisor attended the first BPI workshop. The Pilot Line was launched in March 1996, in order to see World Class Manufacturing (WCM) in practice. The aim is to transfer

responsibility for production and quality to self managed teams at plant level. A project team was appointed by the Stakeholders Representative Committee (SRC) established in the plant as part of the process of implementing the WCM drive. The project team was to plan and implement the pilot line, and was to report to the SRC. The process was thus inclusive and participatory from the outset.

The pilot line showed impressive improvements in set up times, in some instances more that 50%. The standard output rate had increased from 18 to 24 packs per minute which is an increase of 33%. Techniques used on the line included team work, multi-skilling, data recording, visual management, 5S and problem solving. The pilot line received much support and attention from management as well as additional training.

examples of exercises on this pilot line are:

- clearing up and throwing out old parts, cleaning cupboards and labelling
- part identification made easier by organising them according to size and part numbers were enlarged
- Labelled boxes were made for small parts
- brooms and scissors were given a fixed location
- special container labelled for waste is now used to catch the scrap which comes out of the machine
- set up procedures were drawn up based on the concept of Best Operating Practice
- improved batch prioritisation (alike blister sizes to be run in succession) according to production plan
- Standardisation of blister sizes
- Self-adhesive measuring tapes placed onto the machine parts to improve setting accuracy and speed

According to the projects manager the key learning points from the Pilot Line were:

- The potential and tacit knowledge in people which can be tapped and brought out
- That team work is effective
- Through empowering people and communicating attitude changes can be massive
- Motivation is not only about money, but can be achieved through training
- Peoples training needs should be assessed before the start of the project
- People need to be prepared and trained in basic problem solving and performance measurement before embarking on the project
- Issues of job security need to be dealt with before embarking on an improvement programme.

There are clearly benefits for both efficiency and workers from systemic implementation, however implementation is not easy and requires planning, preparation, support and additional training.

While only a few examples of moves towards systemic implementation of 5S emerged, including plant N, L and K, many of the participants used ideas gained in the workshop either in their own work, which had a limited impact on the rest of the plant, or were able to initiate some kind of improvement programme. Interesting improvement ideas arose out of these projects including video taping the production process to get workers to identify problems in production as a starting point for implementing the 5S's. As a result of this the actuall production process was restructured and two unnecessary stages were removed. Other ideas included lights to indicate that grinders were operational, improved storage for dies, and a numbering system for fitting together machine parts. In some plants it lead to the formation of teams and the initiation of team meetings. Very often the kind of project initiated reflected the expectations of the person who had idenfitified the training.

3.3.1.2 Teams:

That plant management are not thinking of the techniques as systemic is reflected in the nature of the teams established in the plants. In many plants, teams operated in name only, or a shift was referred to as a team, but the workers were not multi-tasked and were not engaged in problem solving. It seems as if management may be responding to a fad and calling shifts teams without thinking strategically about the way to get maximum benefit from team work.

Only in two of the plants was the team concept fairly well developed with teams meeting daily (Plants D & N). In the other plants the team concept is limited, and the shifts are simply referred to as teams, which either meet weekly, monthly or when needed, and are not engaged in problem solving activity. In the one plant where the teams are not engaged in formal problem solving and issues discussed at team meetings relate to forward planning, the participant commented that:

> *" We used to not look back at yesterday, always looked forward. It was after the workshop that I suggested to look at previous problems and see ways to improve them.".*

Asked whether he finds the team meetings useful he comments,

> *"They are not yet useful because workers and supervisors have not been in a workshop where they can learn about the technology of productivity. There is no strategic way to approach problems."*

Another participant from plant A commented about the teams in his plant:

> *"We tried to work as a team, when there is a problem some tried to solve it, others still wanted to wait for the setter. We are a team in name, but not practically."*

This contrasts with plant E where the teams have a degree of responsibility for their own output and production. In this plant each team level has goals. They manage themselves, identify and report on their outputs daily and review their own performance monthly. Every 6 months there is a formal review of the multi-disciplinary team. They also identify and create their own responsibility manuals. Issues discussed at daily team meetings which last for 30 minutes include production managed, planning, waste and problems, as well as critical quality indicators.

Only two of the plants had project (or Jishuken) teams in place or were starting them up (Plants N & F). It seems as if plants which had trained the workforce in team building had a more developed team concept. In those plants where there has already been buy-in from the workforce in terms of participation, it was easier for the participants to motivate their colleagues to participate in improvement projects on their return from the workshop. This was evident in plants N, L, K & D.

It thus seems that while organisational level change is taking place i.e. shifts are regarded as teams, often they do not practice as teams. In this case there is again the decoupling of technical and social innovations. There is much hype in management literature around the introduction of teams and hence teams are being formed in plants, yet they do not seem to be strategically linked to production practice. A comment from a manager from plant L illustrates this phenomena:

> *"About three years ago we had a management consultant here and she trained all our staff in what she called "interface methods", it's about functioning in teams, it's about communication, but more on the human side, so it laid that groundwork. But I saw the BPI as giving those teams real tasks, as opposed to just being a team, they are a team with certain objectives."*

3.3.1.3 Normalisation:

Another factor which indicates the depth of understanding in the plant regarding the systemic nature of the techniques, is the understanding of the principle of normalisation. Achieving normalisation in production is a central point underpinning the implementation of JMT's and is one of the key reasons why the 5S system is considered to be so important. To recall Chapter Two, only once normalisation is achieved will the real problems in production become apparent. Achieving normalisation requires strict adherence to Standard Operating Procedures (SOP's) in order to eliminate any deviation caused by operator behaviour, and also requires achieving targets exactly and Statistical Process Control.

There does not seem to be a strong commitment from plants in the sample to a rigid compliance of SOP's. Even in plant L where they had a concerted effort to write SOP's with operator involvement, when asked whether the workers were expected to comply with them, the manager responded:

> *"Theoretically they should stick to them 100%, but things change, you have machine breakdowns, absenteeism, there are a whole lot of factors which are going to cause you to deviate, and we do allow for a certain amount of deviation, probably more that we would be allowed to under ISO, because the guys are experienced enough that they know the only thing you can't do is change the product."*

The supervisor from this plant also commented that they do not try to achieve regular target everyday, and rather build up stock in case of breakdowns (also known as the just-in-case approach). The idea behind continuous improvement would be to raise targets if they were being consistently achieved, however when questioned about the desirability of this the supervisor commented that he did not see this as a possibility:

> *"The workers will complain that if they meet that target, it will be raised again and they will be asked to work harder."*

Plant G is currently implementing the Buker System[9], the first step of which is bringing the process under control. They are required to record every miss, which is either going over or under target, as well as the reasons for missing. Even though this was the step which they were currently implementing at the time of the interviews, the factory manager was proud to report that the shifts had recently been breaking records. He did not consider the goal of achieving exact targets as being desirable, as he believed this would remove the competitive spirit which they have in the plant. It seems as if the records which had been broken in the filling section at the time of the interviews had been achieved by making excess product so they would be able to fill continuously. This clearly goes against the principles of Japanese manufacturing management.

These examples highlight that the most basic principle of continuous improvement, namely normalisation through rigid adherence to SOP's and achieving targets exactly is not considered to be

[9] The Buker system is described as a business excellence scheme with the aim of achieving WCM. It involves implementing systems such as JIT and TQM and begins by investigating supply chain management throughout the plant. URL http://www.buker.com

critical or this point is not sufficiently understood by managers. This in turn highlights that there seems to be a lack of understanding among plants in the sample around the systemic nature of the JMT's. It would also indicate that expecting rigid compliance to standard operating procedures could be an unrealistic expectation in South African plants.

The general conclusion is that plants differ in their view of the systemic nature of the techniques and it is likely that those plants which view the techniques as systemic will reap maximum gain from their introduction. The implication for diffusion is probably that the 'systemic gap' will remain between plants in SA and again points towards uneven diffusion. The factors which could contribute to the systemic gap, as highlighted in the field research, are discussed in the following sections.

3.4 Factors which could inhibit the systemic adoption of Japanese Manufacturing Techniques:

As discussed in Chapter Three, there are various factors specific to Developing Countries which could inhibit the systemic adoption of Japanese Manufacturing Techniques. Joffe et al (1995) sum up the state of manufacturing in SA:

"The poor performance of South Africa's manufacturing sector loomed large in the litany of problems bedevilling the South African economy. The 1980's had been, in economic terms, something of a lost decade. The manufacturing sector was particularly conspicuous in its inability to produce jobs, or to produce commodities that satisfied either the divergent needs of the domestic market or of the international market. A range of factors contributed to this malaise - apartheid's impact on the skills profile of the work-force, repressive and outmoded industrial relations systems and work organisation, technological backwardness ... "(Joffe et al, 1995: introduction). It has been argued, and I tend to agree, that proponents of Lean Production (or Post-Fordism) in South Africa "... tend to ignore the substantial structural and institutional constraints that are part of the legacy of 'racial Fordism' (Ewert, 199 :p. 4). The issues which arose in the research sample are classified below in terms of two of the factors identified in Chapter Three which could inhibit the systemic adoption and diffusion of JMT's in Developing Countries namely Education and Training, Management and Workplace Relations[10].

[10] As the training did not involve techniques external to the firm such as supply chain management this was not examined in the research.

3.4.1 Education and Training:

That education and training play a critical role in the implementation of JMT's was highlighted in Chapter Three. It was discussed that the low level of education in the South Africa workforce could make the systemic adoption of the techniques difficult, and extra effort on behalf of firms is required to improve workers basic education and to provide skills training. This is supported by the findings of the field research.

It became clear in the research that many of the workshop participants were selected for their higher qualifications or because of their grasp of the English language. It emerged that should the same course were be offered to shopfloor workers generally, in many cases it would have to be offered in the vernacular and the materials would have to be simplified. It was also suggested that additional training in the specific tools of problem identification and solving, such as fishbone diagrams should be included (the BPI workshop does not cover these specific methodologies.). For the Pilot line in plant A, extra training was offered in the reading of graphs, and in the tools and techniques for problem identification and solving. In plant N they also completed training in tools and techniques, and there are fishbone diagrams on every whiteboard throughout the plant, but one participant commented that they use the problem solving tools so seldom that they have forgotten how to use them.

An example of the benefit of educated workers and supervisors is provided by plant L, where the Supervisor began initiating an improvement project and training his team while the workshop was in progress. He was not only described by his manager as "a very creative person", but was also completing a diploma in Production Management at a Technicon. He was also given the space to experiment and the support which he needed, (the important role which management plays is discussed later in the Chapter).

Some participants highlighted further that while productivity training is important, there is still a need to develop specific job related skills on the shopfloor. It became apparent that many workers lack the technical knowledge necessary to be able to perform their jobs adequately and often do not have an understanding of the materials which they are working with be they chemicals, fibres or metals etc... The Production Manager from a lead smelting plant related how one of the participants commented on their lack of technical knowledge. The one participant told him that he did not

understand what goes on in the furnace; he said that *the furnace was like a pregnant woman, he knows what gets puts in, and what come out, but he does not know what goes on inside.* At this plant they offered a course for plant operators with Department of Metallurgy and there was a great demand from the workforce to attend and understand the process, even though the course was voluntary and the time they attended was unpaid. An inadequate technical knowledge of materials means that it is often difficult for workers to control quality.

It emerges from the research that an effort is being made in most of the participating plants which are embarking on change programmes to offer training which supports the introduction of Japanese Production Techniques.

In terms of the training initiatives, of the 13 plants which responded to the question, all but one offered training programmes. Two plants offered voluntary Adult Basic Education courses. Eight of the participating plants are offering training to support their World Class drives, and four are only offering skills based training. Plant N has offered TQM and TPM training for the entire workforce, yet a participant from this company expressed that the operators do not have the technical knowledge required to handle the materials involved correctly. At plant E for instance, operators train as Best Operating Practice Operators and this includes competency in performance management, customer/supplier relations, communication (including the company values), teams (what are teams) and waste (cost, flexibility, lead time, manufacturing). This indicates that managers seem to be placing an emphasis on productivity training, probably hoping to affect a change in workers attitudes towards productivity, but they should not neglect skills training which is so important for controlling quality and for workers personal development.

The issue of the **job grading systems** used has been raised by a number of interviewees. The one HR manager commented that the current grading system, as well as hourly wages and Collective bargaining are all rooted in Taylorism and need to be changed. Some plants, specifically those in the metal industry seem to be moving towards the grading system proposed by NUMSA which suggests the reduction in grade categories from 15 to between 5 and 7, and redefines the grades according to core competencies (Joffe et al, 1995:p. 207). At an auto plant in the sample the Industrial Relations manager suggested that "Multi skilling is part of human resource development and we will work with a skills continuum. Skills acquired will be paid for up to level 4. After level 4 it should be skills applied.". Job grading systems thus need to be changed to reflect the changes in production.

The issue of **wage differentials** also emerged as being significant. The full time shopsteward from this auto plant commented that a problem which they had was that team leaders would fall into band 5 and workers in band 4 which means that team leaders would earn 3 times more than the rest of the team. This could have a negative impact on team work and is one of the areas around wage inequality which needs to be addressed in SA'n plants.

While generally in this sample there seems to be an effort to offer training in support of the World class initiatives, Joffe et al (1995:p. 189) report that on average SA'n companies spend 1% of their payrolls on training, while in OECD countries the figure is between 4% to 7%. It also becomes evident however that measuring the amount spent on training is not necessarily a good indication of the degree to which the training is being used. In the plants in the sample which had no formal follow up of the training offered by the BPI, the participants subsequently lost the motivation to put what they had learnt into practice. This then relates to the degree of support from management for the change programme.

In sum, it seems that while there is support from the participants for productivity training initiatives, it emerged that workers still lack the basic technical knowledge needed to perform their work to required quality standards. This is particularly true for understanding the materials which they are working with. Literacy and language skills also seem to be problematic. Most companies in the sample do seem to be making an attempt to train people for their productivity and quality programmes, but only two are addressing basic numeracy and literacy. There seems to be a desire to change workers attitudes without focusing on improving their skills. Further, the commitment from management to make use of the training is still however a primary concern. It seems that companies in South Africa will have to make an extra effort to train both managers and workers for the sustainable systemic adoption of JMT's. Offering training in productivity awareness is not sufficient.

Large wage differentials and job grading systems designed to support the fragnentation of work also need to be addressed in order to facilitate workers co-operation.

3.4.2 Management and workplace relations:

3.4.2.1 Management support:

The first issue identified in Chapter Three regarding management in Developing Countries is the degree of management support given to change programmes. In the sample it is evident that the degree of management support differs amongst plants. In the 8 plants in which there were post-workshop implementations, these were either supported by the appointment of a mentor, or the plants already had change initiatives under way which the participants could slot into. There thus seems to be a correlation between the appointment of a mentor and implementation. Plant A provides a dual example as some of the participants were involved in a pilot line while others weren't. The pilot line received much management support and motivation and showed great improvement (as discussed earlier). Yet, the participants which were not included in the pilot line were offered no extra support or training and did not implement anything. In fact, those participants excluded from the pilot line became resentful that they had not been given the opportunity to show their capabilities and receive the same degree of recognition which the pilot line received. There was no financial reward for the pilot line, but it seemed to make a big impression on the interviewees that the Managing Director had been to visit the pilot line.

In plant N, a 5S drive was launched in one department where the participants were all quite senior. A participant from this division indicated that part of the reason for the lack of progress with the 5S project was a change in management:

> *"We now in our department had an extreme change of management and are also trying to accept new ways of thinking. The old guy believed in it. The new manager went on a TPM course, came back motivated, then normal problems crop up and then fall back into crisis management and blaming people. I then have to remind him of his TPM duties and it works for a while and then falls back to old ways."*

This comment indicates the critical inhibiting or enabling role which a manager can play in the implementation process.

The issue of management offering due recognition for improvement suggestions and involving the workers in the implementation of those suggestions emerged as being contentious. This is illustrated by the example below. The participants from Plant N who attended the second workshop met out of their own initiative following the training and made proposals for factory improvement. They gave their project proposals to management and were put on hold for six months. When they returned from the summer holidays found that their ideas had been used without their involvement. This had

a demotivating effect on the participants as they felt their ideas were being appropriated by management without them being given due credit.

This theme crops up often in the interviews, where management initiate changes but don't involve the operators or supervisors in the procedure. At the end of the day they are still expected to just follow orders and pick up new ways of working without being involved in the planning thereof. The shift from executing work to being involved in the planning of work is thus not occurring in some of these plants. In plant B, a participant had a similar experience, where changes were made to the line and he was not involved in the planning thereof. This indicates that the techniques are being adopted without the accompanying social changes.

The experience in plant D was different. A completely new manufacturing facility was built following a fire, and the participants were given the chance to help design the new factory. The Operations Director was sent to Japan to get ideas from factories there, and on his return he assembled the four supervisors who had been on the workshop and asked them to make suggestions for improvement. One participant comments:

"He took all of us on a tour and we had to point out what was wrong and then come together and see what you would do to better it. Then we really saw everything. Had to write it down for each cell, saw bottles, cups at the workstations. Then all supervisors were called in to meeting and discussed it with them and then we did a clean up. People were first resistant because we were telling them what was wrong. But in the meeting we discussed it, and they started seeing the light and went out to clean. But you have to keep at it because people go back to old habits."

The participants all spoke with enthusiasm about the factory tour and clearly felt that they had made a significant contribution to the workings of the new manufacturing facility.

A comment from one manager highlights the need for a commitment from management:

"I think it is possible we didn't give them all the support which we should have, to be really effective it needs a high level of management commitment, although they are going to drive it. They are going to come up with ideas and if you don't follow them correctly, on time, they are just going to get tired of it."

A study conducted by the National Productivity Institute found that production managers appear to be the least skilled and competent to re-organise production on the shopfloor (Joffe et al, 1995:p. 208). Two of the managers from participating plants had attended the Production Operations Management course at the University of Cape Town's Graduate School of Business (home to the MRT) and this seemed to be a significant factor in improving their understanding of the new production methods. Business schools play an important role in diffusing the new paradigm to management.

A key indicator for shopfloor workers of management support for activities such as 5S is the time allocated for cleaning and team meetings. Very often, the team meetings or five minute cleaning activities are scrapped by management under the pressure of production. This results in workers feeling that their efforts are being undermined. It is critical that management are seen to be consistent in their support of productivity initiatives.

The degree of management support at all levels in the organisation for change programmes, as well as their understanding thereof, seem to be critical for implementation. The degree of active management support and understanding varies greatly in the sample.

3.4.2.2 Workplace relations:

While it was not the aim of the BPI to offer attitude training, attitude change emerged as significant result. That this was such a striking feature of the workshop for the participants is probably a reflection of state of workplace relations in South Africa. Manufacturing in most of the participating plants can be considered to be based on the model of Mass Production and characterised by job fragmentation and hierarchical structures. Further, SA has only recently begun to emerge from decades of abstentionism on behalf of unions, a culture of disempowerment in enterprises and a tradition of management prerogative. Joffe et al argue that the inequality, hierarchy and domination in SA'n firms imposes "outdated forms of behaviour on manufacturing industry" (1995:p. 39).

Comments from two of the participants reflect this:

> *"These systems can be applicable to SA but it will be determined by the commitment of employers and employees. In the past we had a campaign to disrupt the economy for political reasons, but now we're in a democratic SA, so we need to improve production. After the workshop I realised there is a necessity to change peoples minds, to change the mindset will take time therefor it needs the commitment from individuals that have been trained to open eyes of the other workers - this is our government. It became clear from the training that it is my responsibility too."*

and

> *"We are still far away from transition, the sugar industry is close to the agro industry, very paternalistic nature. It is not only management who don't want to move but workers also - they only know the devil which they have to live with, not that they don't want to change. Workers are ignorant of business and how it operates - they have a low education level and have been marginalised from business. The attitude of the shift worker should change. They think they are here for 8 hrs to work and that is it, there is no sense of urgency. Regarding breakdowns etc... people don't feel part of the company. Yet if we can communicate with them about productivity e.g.: what are the implications of a stoppage in terms of cost... There has been no information and they don't understand how important they are."*

The field research highlights that, even in factories where the "us and them" belief is still prevalent, those who participated in the BPI were motivated to get involved in improvement activities. Some reported having difficulty convincing their colleagues of the benefits of such a system, and often got responses such as "dis net die boer se plek". Some participants expressed that if people could be exposed to training such as the BPI they would gain a better understanding, gain a vision of what could be achieved and be motivated to get involved. Management too, has to believe in the benefits of participation in order to encourage implementation following training such as the BPI. The need to instil the desire for change throughout the organisation emerged as a key point from the research, but this needs to be underscored by constructive workplace relations. As another participant commented:

> *"You can't expect people who are treated badly to be productive, a happy man is a busier man. Workers won't entertain the idea if there is no good relationship. The practice of companies in SA is still not conducive but they are moving towards it."*

Granovetter (1990:p. 99) warns against what he terms "temporal reductionism" i.e. treating relations and structures of relations as if they had no history. He argues, for instance, that people carry personal baggage and treating relationships between supervisors and workers purely in terms of the roles that they play according to their job descriptions ignores the whole social aspect of working relations. This is a significant point considering the history of social relations and the divisions between racial groups in this country. It is not a simple process to overcome the personal feelings relating to this historical legacy, and to ignore them and argue that following certain techniques will bring about attitude change is perhaps simplistic. New attitudes may emerge through practice, but the practice itself might be inhibited by the "master/ servant" relationships which continue to be prevalent in plants around the country. As one participant commented:

> *"This organisation can't run along the old lines of master/servant - we need to introduce the team concept of CI mode."*

It seems as if cultural reductionism is still a barrier to effective participation. One white participant who was actually appointed as the mentor for the other participants commented at the end of the interview that:

> *"This workshop is a good thing for every factory in SA. But culture problems exist here, in Japan there's only Japanese and that's why they are successful, some cultures just want to come to work, and go home, and they don't care about anything. This course won't change that culture."*

It is precisely these attitudes which could inhibit the diffusion the Japanese Production Techniques to SA'n plants.

Perhaps the assumption of the MRT that it is not necessary to prepare the groundwork for change and to suggest that change can be affected by training people in techniques and sending them back to their plants is perhaps naive and overly technical. The legacy of the past has to be addressed. It is often assumed that this can be achieved through "learning by doing" and that as people learn new behaviours the form new habits, as argued by Bessant & Caffyn (1996). Overcoming barriers created by the social, political and economic relations of apartheid may however require more of a concerted effort. Plant L for instance began their process by "interface training", focusing on communication and how to work in teams. It would seem as if this has made the participants task of transferring what they learnt from the training to their colleagues easier. The different aspects could

also be addressed simultaneously, and a multi-dimensional training programme devised. The field research shows that through training attitudes can change and participants have indicated that they are motivated to become involved in productivity enhancement. However if management is not ready to encourage the involvement of workers this is soon lost. As the one participant commented:

> *"Management have to believe that the programme works, otherwise they will expose people to a system that they will have no chance to use and the information will get lost."*

3.4.2.3 Job security:

The Japanese system of life long employment has contributed to workers preparedness to contribute to continuous improvement, and the increasing practice of loaning out workers is bringing into question the sustainability of the Japanese system. Fears related to job security emerged in a number of plants as part of the discussions around post workshop implementation. The issue of job security was raised in five of the plants in the sample, F, I, M, N and A. There seems to be an association between restructuring and job loss. Plant I had been through a retrenchment programme and the workers were afraid that if they agreed to participate in work groups this would mean further job losses. The General Manager gave a commitment to a moratorium on retrenchments and the workers gave the mandate to proceed. In plant N, which is three years into it's TQM initiative, the Production Manager commented that they have had some retrenchment since the introduction of the programme which caused a setback in implementation and "hurt the team concept". Initially the company was committed to no retrenchments and during an economic downturn 1992/93, around the time that they launched the TQM initiative, no retrenchments took place.

This is in an economic environment where 40 000 jobs were lost in the first quarter of 1997 (Millward, Mail & Guardian August 15 - 21, 1995: P. B39). It is estimated that unemployment is above 30% of the labour force (Adelzadeh, Mail & Guardian June 6 - 12 1997:p. B2). Adelzadeh, from the National Institute for Economic Policy, also argues that the governments macro-economic policy in the form of the growth, employment and redistribution strategy (GEAR), with its disinflationary tight monetary policy and accelerated trade liberalisation could potentially lead to a further loss of manufacturing jobs (ibid).

While management may attempt to use the threat of job loss from increased competition to gain commitment to changes in work organisation, there seems to be an association between 'restructuring' and excess labour in the minds of workers and unions. Job insecurity and a failure to

stabilise employment in the manufacturing sector could thus inhibit the diffusion of JMT' in this sector. Companies would probably have to offer a moratorium on retrenchments in order to elicit support for change programmes from workers. Alternatives to retrenchment can be found. An example is the union-management negotiated solution to retrenchments in an auto plant in the sample which entailed the creation of a training pool of 250 workers to support the multi-skilling process.

3.4.2.4 Role of the Union:

A further factor which effects the diffusion of JMT's is the role of the union. Some argue that in the absence of a union the process of diffusion would have less obstacles. I will argue in this section that in the SA'n case, unions could play an important role in promoting the conditions necessary for the sustainability of change programmes and thus aid the process of diffusion. It is highlighted in Chapter Two that the success of Japanese Manufacturing Techniques relies both on the adoption of technical and social innovations. In the light of the fact that the social innovations which support the technical practices in Japan are not being transferred, and that generally workplace relations and management attitudes in SA are not conducive to gaining workers commitment to the system, these supportive conditions would need to be established. It seems that what would be necessary in the South African case is to promote increased participation in the workplace, together with the upgrading of the workers skill profiles and putting incentive schemes in place. Unions could thus play an important role in ensuring that the technical innovations of workplace change are accompanied by the necessary social innovations. It is however important to bear in mind that unions have different policies, some are willing to engage in productivity improvement and restructuring while others aren't. The examples drawn from the research below highlight the importance for systemic adoption of involving workers in decisions around workplace change.

While to some the examples above may appear as obstructionism on behalf of the unions, I would argue that the unions play an important role in ensuring the interests of workers are promoted and that this in the long run will contribute towards the sustainability of the changes. It is a mistake to assume that just because the discourse of World Class Manufacturing is one which supposedly promotes workers interests that this is necessarily the case, and in many instances management wish to retain their prerogative to manage without consulting workers about changes. As Joffe et al (1995: p.196) highlight, "A number of companies interviewed argued that they wanted to be world class and needed their work-forces to commit themselves to this process. Yet, they failed to consult with their work- force over changes to staffing levels or layout, introduction of machinery or team-

work, scaling down of certain of their activities, or investment in literacy and skills training. As a management consultant has argued 'managers need to review how they think as much as what they think about.'"

One production worker commented on his exclusion from decisions regarding changes made to his work:

> *"When I learned on the BPI that to be productive you need to save time and to make decisions, but I am not involved in decision making. If they want to change the machine they should include me, they change things without your concern and this causes demotivation. What if they change a thing and it is stremuous for you. They must get the shopfloor worker and management and engineering together, management is not working there, they are always in the office."*

It is interesting to note that very few of the participants knew what the BPI training was about, did not know why they were selected, had no idea what to expect and did not know what was expected of them. This indicates a lack of transparency in the selection process, which could already indicate that the practices in the plant are not participative. Only in one company was the selection of the participants left up to the shopsteward committee.

There are a number of SA'n companies which have recognised the importance of increasing participation in the workplace. Two of the companies mentioned by Joffe et al (1995:p. 210) are SAB and Nampak, both of which had plants participating in the BPI. The manager from one plant indicated the extent to which they have gone to include the union in decision making:

> *"Unions sit in on management meetings when financial issues get discussed. We train and teach the shopfloor to interpret this financial information and production statistics."*

The attitude towards unions is however diversified in the sample. In contrast to the example above, management in plant B "... has its own legacy of attempts to crush a militant union, reflected in a series of strikes and retrenchments even during the early 1990's." (Kaplinsky & Mhlongo, 1996:p. 25). The plant has recently been unionised, but the management interviewee believes that it was unnecessary to unionise. He commented that: "Exploited workers need unions but we treated workers well - so don't need a union." This reflects a unitarist vision of Industrial Relations, while Kaplinsky and Mhlongo (ibid) cite bitterness and resentment on the part of workers towards the

company. Two of the participants also referred to the poor relationship between management and workers which they believed would hinder implementation. The production management who view themselves as progressive and open, are clearly out of sink with the reality on the ground. Perhaps they are progressive relative to other managers in this small rural town in Kwazulu-Natal.

The relations is each plant are characterised by differing social complexities. In only three of the plants the teams actually chose their own team leaders, in all other plants team leaders were either supervisors or team managers appointed by management. This indicates that the nature of the changes in the plants is technical, and the accompanying social innovations are, for the most part, not taking place.

In one plant (M) for instance, the issue of team leaders playing the role of 'indunas' arose and the union demanded to clarify the role of the team leader. When the team leaders term of office had expired, new team leaders were elected, both union members. The department manager however would not accept the new team leaders. He felt the team leader, who was the only person in the department who had attended the BPI, was doing a good job. At this stage a meeting was called where the union pointed out that it seems now as if the team leader is being used by management as a boss boy (induna). This led them to ask for a reclarification of the role of the team leader. The relations in this plant are still hierarchical and it seems as if the department manager did not want to accept more democratic work practices. The one manager stated that:

"The culture is yet to move at this plant towards a more participative culture."

In this case it is not the behaviour of the union which inhibits diffusion, but that of the manager who wishes to retain managerial prerogative. Clarifying the role of the team leader could in fact be an important step toward successful implementation. It would seem to me that workers are more likely to be committed to team work if they are able to participate in determining how teams will operate.

This is in contrast to the pilot line in plant A where the team leader and jobs rotated with each batch. This indicates that every person in the team was equipped to be batch leader and to do every job, an idea supported by the project manager. Supervisors in the plant who were all qualified pharmacists, which indicates that they have a higher standard of eduction than most. This system had been put in place by a project team established by a Stakeholders Representative Committee (SRC) where the issues related to the change programme were discussed. The SRC includes union representatives. It is interesting to note that in most cases the unions believe that the structures set up to negotiate

workplace change, like the SRC mentioned above, are attempts by management to bypass and weaken union structures[11]. In this instance, the project manager felt that the Stakeholder Representative Committee had been hijacked by union issues which he would have preferred to be seen negotiated in traditional union structures.

The example of plant I illustrates the role of the union in the process of workplace change. The shopstewards have sent management back to the drawing board over a number of proposals. One example refers to the productivity incentive scheme proposed by management. The shopsteward explained their concerns around the productivity scheme:

> *"The incentives work on a sliding percentage scale and give an integrated figure... With regards to cost, management's proposals were problematic because they are talking only of production costs which relates only to the shopfloor ... but the union recognises that there are a whole lot of other costs coming from admin. - we don't know how to deal with this but we sent management back to refine their proposals. The incentives won't only be going to the workforce but to all the employees, yet they are putting all the responsibility for cost saving on the shopfloor."*

The union in this case seems to be setting the groundwork for workers to participate willingly in productivity improvement, by demanding fair rewards.

The comments of one factory manager who sent two shopstewards on the workshop, indicates that he was concerned about getting the union to cooperate in the change process:

> *"I wanted to get the shopstewards involved. The workers were a bit suspicious of involvement at first. I thought we could use the shopstewards as a vehicle to get the union on our side. Now I think this was a wrong approach. Now we see that involving people from day one automatically creates the atmosphere that we want."*

It seems that management want buy in from workers, and as highlighted earlier, this emerged as one of the main reasons why they sent teams on the BPI workshop. However, many do not seem to have the willingness or the vision to make the social changes necessary to support workers participation in productivity improvement. Noting that conflicts in the social relations are likely to persist through

[11] It seems that it is for this reason that unions are not rushing to implement workplace forums as provided for in Chapter V of the LRA. In one plant in the sample management were keen to introduce a workplace forum but the union, CWIU, was not interested. Since it is the union which has to initiate a worplace forum according to the act, a forum has not been introduced.

the transformation to JMT's ways to gain workers compliance need to be established (as argued in Chapter Two).

If the research of the Industrial Strategy Project (ISP) commissioned by COSATU can be taken as an indication of the direction of COSATU policy, then they clearly question the desirability of the Lean Production system for a society characterised by (or wishing to be characterised by) a strong and unified trade union representation, with critically minded workers and a tradition of human oriented values. They agree with those who argue that Lean Production results in subsuming workers to the system, and intensifying work. (as discussed in Chapter Two) This they argue is particularly true in countries like South Africa where the hierarchical style, together with conflictual relations on the shopfloor, results in some elements of the Japanese Manufacturing System being misinterpreted. Examples of this include multi-skilling being interpreted as multi-tasking, new technologies being used to enhance surveillance and control rather than to improve production (e.g. SPC), a focus on cost-reduction using sub-contracting for example rather than enhancing multi-factor productivity and lastly workplace decision making is often seen as a means of bypassing the union, rather than as a means to democratise the workplace and devolve responsibility (Joffe et al, 1995:p. 195). They argue that "... lean production has, in South Africa, come to be associated with displacement, rationalisation and retrenchment." (Joffe et al, 1995:p. 195).

The ISP proposes instead an Intelligent Production Strategy which they see as addressing the key factors which contribute to poor manufacturing performance in SA including rigid work practices, hierarchical and authoritarian management control, racial and gender divisions of labour, large wage gaps, adversarial collective bargaining and the low skills profile.

The Intelligent Production Strategy (1995:p. 205) address these issues and draws together the separate components of human resource development, work organisation, skill upgrading and the remuneration system, as well as plant-level governance and collective bargaining. It does so by combining four inter-linked principles; constant skill acquisition, reorganising work along team lines, broadening the notion of productivity and democratic practices in the workplace.

The term **Intelligent Production Strategy** refers to the three fold requirement of:
Intelligence - skills, knowledge and informed decision making capabilities

Production - which is efficient and flexible: this includes team oriented work organisation, flexibility, job design and broadbanding of grades

Strategy - this highlights the need for management and labour to jointly plan, implement, and monitor the new production techniques and the associated requirements necessary to move toward more demanding, quality product markets (Joffe et al, 1995:p. 205).

It seems as if the Intelligent Production Strategy approaches the work arena with the human at the centre, as opposed to the system. It would seem to me that what the ISP is proposing amounts to a human resource system for a modern factory, and one which would support the implementation of JMT's. While the ISP criticises lean production as resulting in the intensification of work, and they question the desirability of the system for South Africa, they do not offer a technical alternative, but rather a social alternative. They thus remain silent on what techniques would be employed in production, and how this would differ from lean production or mass production. The move towards the 5 job grading system being applied in the auto plant mentioned earlier, seems to arise out of these proposals, which indicates that some unions (e.g. NUMSA) are already promoting these innovations.

It seems to me that considering the poor state of workplace relations and the poor quality of management commitment to and understanding of the nature of workplace transformation, unions could play a role in advancing the sustainable and systemic adoption of Japanese Manufacturing Techniques[12]. Unions which subscribe to the Intelligent Production Strategy may even prove to be more proactive in terms of establishing the conditions necessary for JMT's than the management in the plants in which they are engaging. Unions however which view plant level change as a threat are likely to resist the implementation and could thus inhibit the diffusion of JMT's.

4. Conclusion:

The key concern of the chapter was to look at issues which may affect the process of diffusion of JMT's. As this is not a representative sample it is not possible to make general conclusions about SA'n industry. The examples however do provide us with some pointers as to the factors which may affect diffusion generally.

[12] The involvement of labour unions in Australia could be an example, where moves to WCM (or international Best Practice) were spear headed by the labour movement after years of adversarial industrial relations (see Mathews, 1995).

It is evident from the above discussion that the post-workshop implementation of 5S and visual management in plants in the sample is varied and diversified. The results of the research seem to indicate that the process of diffusion of Japanese Manufacturing Techniques to plants in SA is not going to be uninhibited and there are a number of factors which arise during the transformation process and impact on implementation. As discussed in the previous chapters, it is not realistic to assume that the model can be borrowed and implemented without considering the social and institutional environment of the implementing plants.

The examples from this sample seems to indicate a diversity in perception around the systemic nature of the techniques and a 'systemic gap' is already evident. Some plants in the sample are more likely to progress along the path of continuous improvement, others have not grasped the basic principles and while they may benefit from changes in work organisation in the short term they may never approach systemic adoption.

The factors which impact on systemic adoption which arise out of the research have been highlighted. In terms of Human Resource Development it was found that additional training is needed for both management and workers, and there does seem to be an effort on behalf of the participating firms to provide this training. Training in productivity improvement would be well received, but workers also need to enhance their technical knowledge of the materials which they are working with. This in itself is likely to contribute to quality and productivity improvement. However, the extent to which the company extracts value from the training depends much on the degree of management support for the initiatives (particularly shopfloor and production management), and the willingness of workers to be involved in continuous improvement. This in turn is affected by the poor state of workplace relations, and other issues such as the large wage differentials, job insecurity and grading systems which do not recognise the enlarged jobs and skills required for continuous improvement. The conflicts and inequalities which exist in the workplace in SA are likely to impact negatively on the technology transfer.

What emerges as a significant factor from this research is the need to recognise that the introduction of Japanese Manufacturing Techniques involves both technical and social innovations. This research supports Posthuma's (1995) findings in Zimbabwe that the relationship between technical and social innovations is not necessarily understood by managers. The systems are socio-technical in nature and thus both elements need to be in place. The example of adherence to SOP's is relevant here.

Trying to get workers to rigidly adhere to SOP's which they had no involvement in writing, is likely to be difficult, and the operating procedures are not likely to reflect what the operator does in reality. Excluding operators from writing SOP's also excludes them from the process of firm level learning and continuous improvement.

A comment from one of the participants about what he learnt on the workshop illustrates this point:

> *"The operator does it for a while and then goes back to old his own ways - if only I could understand why the operator goes back to their own way - maybe I should let him have input into the procedure, maybe that is where we failed."*

This is a case where technical innovations are not accompanied by social innovations. The reverse is also true: implementing teams, a social organisation, without giving them specific technical objectives is not likely to help the company move along the systemic path, and is more likely to lead to disillusionment. It is thus likely that a failure to recognise the systems as socio-technical will negatively influence the process of diffusion.

Transferring the techniques of Japanese management into a low skill environment in the context of hierarchical relations, is likely to mean that the techniques used will require low skill and low involvement. This will probably inhibit the systemic use of the techniques which in turn signifies that diffusion will be uneven. Enterprises with more participative cultures, which stress team work and involve workers and their unions in decisions regarding their own work, and which reward and recognise the increased skills and responsibilities, are probably likely to attain greater co-operation from the workforce and hence achieve a more sustainable transformation.

The Intelligent Production Strategy proposed by the Industrial Strategy Project could provide the supportive Human Resource practices, in terms of addressing issues such as job grading systems, reward structures and training, needed to sustain the technical changes involved in the adoption of Japanese Manufacturing Techniques. Unions which adopt this position may thus be assisting in laying the groundwork for their introduction.

The nature of the South African workplace is *very far from Japan*[13], and a significant effort will be required at all levels to attain systemic adoption. The indication from the discussion in this chapter is that the most likely that Japanese Manufacturing Techniques will diffuse unevenly in SA.

[13] This expression is borrowed from Williams et al, 1994

Chapter Five: Conclusions:

This research comes at a time when much interest is being paid in both management and government in South Africa to the question of improving manufacturing performance. Academics too are interested in a number of different aspects of changes in manufacturing patterns. The success of Japanese manufacturers in the last few decades has drawn attention to the techniques employed in Japanese enterprises. In this thesis I have critically examined the dominant modes of discourse in the management literature in order to challenge the perceptions that the adoption of Japanese Manufacturing Techniques (JMT's) lies within the ambit of the firm, and that the techniques are universally applicable. A study of the critical literature and empirical examples of the transfer of the techniques to other national contexts highlights that national conditions impact on the adoption and implementation of JMT's. In this thesis I also depart from using a model as the point of departure for analysing diffusion, and have chosen rather to look at the guiding principles and real examples of transfer. This research thus contributes to the debate not only through critical examination, but also by adding to the growing collection of empirical evidence of adoption in developing countries. The experiences of fifteen SA'n plants which participated in training workshops designed to transfer and disseminate shopfloor best practices to plants in SA have been documented and analysed. By examining empirical evidence, guided by a thorough literature survey we are able to better understand the process of implementation in enterprises and the factors which are likely to impact on this adoption. This research departs from those who draw conclusions about implementation by studying the efficiencies of the techniques themselves, and looks rather at questions of how the technology of Japanese Manufacturing Management actually diffuses.

The general objective of this research was to explore the factors which could impact on the path of diffusion of Japanese Manufacturing Techniques to manufacturing enterprises in South Africa. This should provide key indicators for policy makers as to the critical areas which supply side support measures should address. This has implications beyond the Departments of Trade and Industry, to questions of improving basic education, and promoting equity and the democratisation of the workplace.

The results have shown that there are significant factors which could impact on the systemic adoption of the techniques in firms in developing countries generally and South Africa specifically.

This in turn is likely to impede diffusion across industry and it seems as if the most likely possible scenario is that of uneven diffusion.

I have argued that a universalistic account of Japanese Manufacturing Techniques is not useful for an analysis of diffusion. The universalistic school would foresee rapid diffusion because they have abstracted a model from it's social and institutional context. Because they ignore the embeddedness of the techniques, factors which impact on the process of diffusion are not considered. Using the model itself as a point of departure for analysis is not useful for understanding diffusion. Adopting a national or firm centred approach leaves a more open ended agenda to investigate the path of diffusion. Analysts from within these schools of thought would either foresee steady or uneven paths of diffusion, depending on how they answer questions which underlie an analysis of diffusion (as outlined in the Chapter One).

Because this thesis is primarily concerned with looking at the level of the firm, I have focused on primarily addressing two out of five of these questions, which are:

- *Are the systems easy to introduce or do they require fundamental changes to the social relations in the firm and a new approach to production management requiring certain technical capabilities?*
- *Is JIT/TQM a set of principles or techniques whose effectiveness depends to a large extent on the adoption of a complete package of interrelated changes? (i.e. the extent to which the paradigm is seen as systemic)*

Addressing the question of paradigm shifts is important. The perception in much of the management literature that JMT's involve a new paradigm, covers up questions of continuities between the two systems and ignores the fact that hybrid forms are likely to emerge during the transformation process. These factors are likely to impact on diffusion and are likely to change the final shape of the improvement programme. For firms moving from mass production to lean production or World Class Manufacturing, it is evident that hybrid forms are emerging and that many continuities remain.

This question is addressed primarily in Chapter Two. I argue that for mass producers, Japanese Manufacturing Techniques represent a significant change with regard to the principles of production, but not necessarily with regard to the labour process itself. The areas which I suggest represent a major departure from mass production are the focus on the elimination of waste and the elimination

of uncertainty in the production process, within the context of continuous improvement. The use of the techniques themselves can not, however, be said to transform the social relations in production, and the physical manifestation for labour remains much the same. The Japanese Manufacturing Techniques can not be considered to be inherently more rewarding and enriching for workers, and conflicts in the labour process are likely to remain. The degree to which there are changes in the social relations in production depends largely on the extent of workers participation in firm level learning, but the nature of the work itself is not significantly transformed, some argue it is even intensified. JMT's have been referred to as "high-tech Taylorism". So, transferring the techniques without making any accompanying social changes, means that it will probably be difficult to get the co-operation of workers to participate in continuous improvement. There is a tendency in the management literature to view the system as the solution, but people still have to be committed to operating the system at the required levels of efficiency. Therefor, failing to see that the technical changes need to be supported by social innovations, is likely to impede systemic adoption. Workers and unions should not necessarily dismiss the implementation of JMT's because they don't represent a radical change in production relations. Employing the techniques may be good for the profitability of the enterprise, which in the long run, is a necessary condition for increased wages. Workers and unions should respond by motivating for the social changes, such as an integrated training framework, changes to the grading structure and increased worker participation in decision making.

With regards to the question of whether the effectiveness of the techniques depends on their systemic adoption, I highlight that the use of tools in isolation will bring results, but that probably only with systemic adoption will the changes be sustainable, and in the long term, competitiveness of the company improved. The adoption of the techniques is an incremental process, and thus the question is whether the current pattern of diffusion in developing countries represents an incremental curve moving towards full systemic adoption, or if it indicates that firms are on fundamentally different paths is open to interpretation. If there are factors which significantly impact on systemic adoption, then it is likely that some firms will be able to make advances towards systemic adoption, while others will be significantly constrained. This is referred to as the "systemic gap". The implication is that there are different possible paths of diffusion.

The factors which could impact on systemic adoption in developing countries were the subject of investigation in Chapter Three, and it emerged that there are many factors prevalent in developing countries which could impede systemic adoption. Factors include macro - economic instability,

labour market conditions (job security), workplace inequality, low education level of the workforce and poor quality management. Other factors such as the poor physical infrastructure and weak small and medium enterprise sectors also play a role. It is evident that not all these factors are in the ambit of management to change, and even for those that may be, not all managers are capable of, nor willing, to effect change.

The most outstanding factor which emerged from the field research (of fifteen South African companies) as impacting on systemic adoption is the failure of management to view the techniques as involving both technical and social transformations. This, it seems, is a result of *firstly* imperfect information about the techniques, and *secondly* due to the state of workplace relations in the enterprises. The understanding of the systemic nature of the techniques is varied in the plants in the sample, as are the different stages of implementation. Some plants were only investigating the possibility of going the "World-Class" route, while others had been implementing programmes such as TQM for some time. Only a minority of managers interviewed in plants which were already implementing JMT's, seem to have grasped the basic principles and understand the systemic nature of the techniques. Further, in many of the plants the state of workplace relations is characterised by hierarchical supervision and inequality, which causes unco-operative working relationships and alienation. Issues such as large wage differentials, job insecurity, grading systems and creating a participative culture will need to be addressed if the adoption of the techniques of production is to be successful.

Additional training for both management and workers will also need to be provided. *Firstly*, the workers technical knowledge needs to be upgraded. Workers need to be able to understand the materials and processes which they work with. Numeracy and literacy levels will also need to be upgraded. As an indication of the level of commitment which firms show to improving workers education, only two of the plants in the sample were offering Adult Basic Education programmes. For the first time many workers in these plants were able to understand their pay packages let alone read production figures. Education and skills training are the first steps to improving quality.
Secondly, training in the philosophy and tools of Japanese Manufacturing Techniques needs to be provided for all people in the enterprise. However, training is only effective to the extent that there is a determination to extract value from it. Out of the fifteen plants in the research sample, only eight made an attempt to integrate the training by following up with projects. The education level of workers, particularly innumeracy, could affect the application of techniques such as Statistical

Process Control, and the techniques will probably be adapted to a low skill environment. This could result in production workers being removed from understanding and accepting the basic principles underlying JMT's, and limit their involvement in continuos improvement. Considering that continuities in the labour process remain with mass production, including the conflicts, means that the techniques could manifest as 'management by blame'.

The combination of hierarchical authoritarian environments, together with the low skills profile in the workplace, could mean that the techniques will be adapted for low skill and low involvement. This could impede systemic adoption and impact negatively on the competitive advantages which could be gained from systemic adoption.

Unions could either play an enabling or inhibiting role in the process of adoption, depending on their policy towards participation in productivity improvement. Unions which support a strategy similar to the Intelligent Production Strategy (IPS) may in fact be building the human resource system that would assist with the systemic the adoption of Japanese Manufacturing Techniques (as argued in Chapter Four). The IPS addresses issues such as job grading, training, as well as workplace democratisation.

Not all the plants in the sample are embarking on change initiatives, and of those which are it seems that only a few are likely to implement the techniques systemically. As highlighted in Chapter Two, the application of the techniques is not suited for all companies, and needs to be aligned to the firms overall competitive strategy. Firms which adopt the techniques without considering their strategic objectives are likely to find that 'The emperor has no clothes.' Firms should be encouraged to consider their overall competitive strategy and target markets before jumping on the "World-Class" bandwagon. This could enable them to make appropriate choices regarding the most suitable production paradigm.

The answers to the questions highlighted above would seem to indicate that in terms of these two factors, the path of diffusion of Japanese Manufacturing Techniques would be uneven. It must be remembered that there are other questions which also need to be answered to get a complete picture of the possible diffusion path. Also, the sample can not be considered to be representative of all South African manufacturing enterprises, so the conclusions drawn only act as indicators. They are

however borne out by much of the empirical literature, and the in-depth understanding of the processes gained by the researcher suggests that they should be taken seriously.

The main implication of the findings for policy makers concerned with supply side measures at micro - level, would be that the intervention in the promotion of Japanese Manufacturing Techniques should be targeted to those firms which know why they are adopting the techniques, which have top management support and which are prepared to go the distance. This involves transforming the nature of social relations in the workplace towards increased participation and equity. Should a dissemination or demonstration programme be initiated, firms should probably have to display certain criteria in order to qualify for assistance, like stakeholder participation. Policy makers should approach with caution the literature which claims that the techniques are universally applicable, and should be adopted by all enterprises as soon as possible. Before the techniques are even implemented, diffusion is already made difficult by the fact that the techniques are being transferred into different social and institutional contexts from where they were developed. Using the model of Japanese Manufacturing Management, and focusing on the efficiency of the techniques themselves, could thus prove to be misleading.

From the discussions presented in this thesis it would seem that there are significant factors which could impact on the systemic adoption of JMT's in many firms and that a "systemic gap" is likely to emerge. The indication is that the most likely scenario for SA'n manufacturing is one of uneven diffusion of Japanese Manufacturing Techniques.

List of Appendices

Appendix 1

Interview Schedules

1.1 Interview Schedule for Participants and motivations behind the questions

The Workshop

Q5[1]. Why were you chosen to participate in the workshop?

Q6. What did you know about the workshop before you attended?

Q7. Do you think that other operators and supervisors should attend the same or similar workshop?

Q8. What did you think of the contents of the workshop?

a. Slides; b. Videos; c. Field Practice

Q9. If there was one thing about the workshop that really struck you, what was it?

Q11. Did you notice any changes in the way you viewed your work before and after the workshop regarding the following areas;
a. teams; b. customers; c. problem solving; d. waste; e. kaizen

Implementation:

Q12. When you returned from the workshop, did you want to use what you had experienced in your work?

Q13. What happened when you returned form the workshop? Describe the process.

Q14. Was someone appointed to be in charge of the process? Were they appointed before or after the workshop?

Q15. Have you been able to use what you learnt on the workshop in your work?

Q 16. What ideas which you learnt on the workshop have you used in your work?

---

[1] The numbering of the schedule may seem strange. It was an original formatting error. For the sake of consistency with the data I have decided to leave it unchanged.

Q 17. Is anything done differently now to how it was done before?

Teams:

Q18. Are there teams in this plant?

Q19. Are you a member of the team?

Q20. How are the teams made up?

Q21. How is the leader appointed?

Q 22. Does the position rotate?

Q23. What are the functions of the teams?

Q24. How often and for how long do the teams meet?

Q25. What are the main issues discusses at team meetings?

Q26. Are the team meetings useful?

Q27. What do you think about working in teams?

Q27b. How much problem solving gets done as a team?

Waste:

Q28. What do you think is waste?

Q29. What kinds of waste are you concerned with?

Q30. Does your plant have a housekeeping method? Are you using 5S in your job?

Problem Solving:

Q31. What are the kinds of production problems that occur?

Q32. What happens when a production problem occurs?

Q33. Are you doing any problem solving?

Q34. How do you go about solving problems, is there a formal method which you use?

Q35. Have suggestions for changes been made by production workers?

Q36. What happens as a result of these suggestions?

Q37. What happens when you want to suggest changes to the production process?

Q38. Were you involved in any kind of problem solving before you came on the workshop?

Visual Management:

Q39. What do you think of visual management?

Q40. Is there any visual management used in this plant?

Q 41. Have you used any visual management ideas in your own work?

Q42. Did you know about visual management before you came on the workshop?

Q43. Are you required to record and display your absenteeism?

Q44. What do you think about this?

Data Recording:

Q45. Is production data recorded in the plant? What aspects of production are measured?

Q46. Do you record production data, if so what?

Q47. Are there formal methods which you use?

Q48. Is production data visually displayed?

Q49. What do you think about this?

Q50. Have there been any changes in performance since the workshop?

General:

Q51. Have you discussed what you learnt on the workshop with others who were not on the workshop? If so who, What was their response?

Q52. What has the response of your colleagues been?

Q53. What other training have you received in this line this year?

Q54. What does this company have to be good at in order to compete in the market?

Q55. If you were an advisor to the department of trade and industry, and you could suggest how they spend their training budget for 1997,. would you recommend that they spend it on something like to BPI workshop, or is there other training which you think is more important for shopfloor workers?

1. 2 Interview schedule for company liaison people

Intro: A few basic questions to get an overview

Q1. Can you give me a broad picture of what is going on in the plant?

Q2. What kind of manufacturing process is it? cellular, assembly, batch, job shop.

Q4. How many people in the plant?

Q5. How many shopfloor and how many non-shopfloor employees?

Profile of company.

Q6. Why was it decided to send a team on the workshops?

The Workshops

Q7. Who decided to participate in the workshop?

Q8. Does it fit in with the manufacturing objectives of the firm, how?

Q9. What were your expectations of the training?

Q10. Were your expectations met, if not why?

Q11. On what basis were the participants chosen and why?

Q12. Were they selected from a specific line or where did they come from in the plant?

Q13. Have you noticed any changes since the people came on the workshop?

Q14. Has there been any difference in the ways in which work is being done?

Q15. What happened when the teams returned from the workshops?

Q16. Did they communicate to their colleagues about what happened?

Q17. Was someone appointed to manage the trainees and the implementation of what they learnt?

Q18. Was this person appointed prior to or following the workshop?

Company Strategy: To determine the company culture and commitment to improvement programmes

Q19. What other training has been offered in these areas?

Q20. Can you give me a broad picture of what is happening in the plant?

Q21. Is there a determined improvement program?

Q22. What is it called?

Q23. Does the company have a NOSA and ISO 9000 rating?

Q24. What does this plant have to be good at in order to meet the competition?

Q26. What level management support does it receive?

Q27. do you consider work organisation to be a key to success in your plant?

What elements of JMT's have been adopted in the plant?

Q28. how is production organised? Do they have cellular manufacturing

Q29. What elements have been adopted in the plant; 5S, Visual management, suggestion schemes, JIT (kanban), quality and source, performance measurement

Q32. How does the new program differ from the way work was done previously in the plant?

Q33. Are there any productivity related incentives and how do they work?

Q34. Have there been any major hitches along the way?

Q35. Has there been any opposition to the program?

Q36. Have any changes been made to the corporate hierarchy?

Q37. Is there any career pathing?

Q38. what are the main training priorities?

Q39. What is the IR like in the plant?

Appendix 2

Mail Questionnaires

2.1 Mail questionnaires for participants

Dear Participant

This research is being done to follow up on the Best Practice Workshops. Every person who attended the Best Practice Workshop has been asked to participate in this research. You are free to refuse to fill in this questionnaire, it would however be helpful if you would. You do not have to put your name of the questionnaire, even if you do, you will remain anonymous.

You may know that the workshops were set up as part of an experiment to see if these Japanese systems can be used in SA. We thus have three aims in mind for this research:

1. To find out what the people who came on the workshop think about the use of these systems in SA and what their experiences are back at the plant.
2. To evaluate the training which we offer and to see in which ways we can improve.
3. To be able to advise the Department of Trade and Industry about whether they should sponsor such training.

Please be as honest in your responses. It is important that the results of this research reflect the truth as closely as possible. There is no such thing as a right or wrong answer.

Thank you !!

1. Company name: _____
2. How many years have you been employed in this company? _____
3. Which workshop did you attend? **(please circle)** February May July

4. Did you know anything about the workshop before you attended? **(Please circle)**
No / Yes.
If yes, write what you thought the workshop would be about _____
_____
_____

5. Please show what you thought of the following aspects of the workshop: **(please circle the chosen number)**

5a) The slides used on the overhead projector were

easy to understand **difficult to follow**

1 2 3 4 5

5b) The videos about 5S and Visual Controls were

a good teaching tool **not a good teaching tool**

1 2 3 4 5

Give a reason for you answer:
_____
_____

5c) The field practice was

a good way to learn **not a good way to learn**

1 2 3 4 5

give a reason for you answer:
_____
_____

6. If you could say that one thing from the workshop really sticks out in your mind, what is it?
_____
_____

7. What was for you the most important thing that you learned on the workshop? _____

8. Did you tell anyone about the workshop when you returned ?

9a. Did you want to use what you learnt on your return to the plant?

not at all				very much
1	2	3	4	5

Please explain: _____

10. Were you able to use what you learnt on the workshop in your work? **Please circle**

Yes / No.

If no, why not?

11. If you have used any ideas which you learnt on the workshop in your work, please write down some examples?

12. Is anything done differently now to how it was done before you came on the workshop? Yes / No

Please explain: _____

13a. Are there teams in this plant? Yes / No

13b. Are you a member of a team? Yes / No

14. How often and for how long do the teams meet? _____

15. What kinds of things do you discuss in your team meetings? _____

16. Do you find team meetings useful?

not useful at all **very useful**

1 2 3 4 5

Please explain why you think this ? _____

_____

17. What do you think about working in teams?

it is not good to work in teams it is best to work in teams

1 2 3 4 5

Please explain why you think this ? _____

_____

18. How is the team leader appointed? _____

19. Please describe waste: _____

_____

20. Give an example of waste from your experience _____

_____

21. Name three problems which occur frequently in your production:

1. _____
2. _____
3. _____

22. Are you formally involved in solving production problems as part of your job?
Yes / No.

23. Were you involved in problem solving before you came on the workshop? Yes / No

24. What happens if you make a suggestion to improve production, how does this get followed up and implemented?

_____

_____

25a. Describe what you remember about visual controls on the shopfloor _____

_____

25b. Have you used any of these ideas in your work? Yes / No.
If yes, give an example: _____
_____

25c. Did you know about visual controls before you came on the workshop? Yes/ No

26a. Have you discussed what you learnt on the workshop with others who were not on the workshop? Yes/ No
26b. If yes, who? _____

26c. What was their response? _____

27. Have you received other training which covered similar topics to the Best Practice Workshop? _____

28. What are the main things that your plant has to be good at to succeed in the market? Please rank the following from 1 (highest) to 4 (lowest):
cost ( ) ; quality ( ) ; delivery ( ) ; product availability ( )

29. Do you think that other operators / supervisors in the plant should attend the same or similar workshop?

30. If you were an advisor to the Department of Trade and Industry and you could advise them how to use their budget for shopfloor training, would you recommend that they spend it on something like the Best Practice Workshop, or do you think that there is other kinds of training which would be better ?
Best Practice Workshop / Other
Explain: _____
_____
_____
_____

Your Name: _____
Your Job Title: _____
Date: _____

THANK YOU VERY MUCH FOR YOUR TIME AND FOR AGREEING TO FILL IN THIS QUESTIONNAIRE.

2.2 Mail questionnaires for company liaison person

Dear Research Participant

This research is being done to follow up on the Best Practice Workshops. Every company which sent participants on the Best Practice Workshop has been asked to participate in this research. In each company the person who booked the trainees on the course has also been asked for an interview or to fill in a questionnaire. Please could you take the time to participate in this research. The research report will be passed to you for comment before publication.

You may know that the workshops were set up as part of an experiment to see if these Japanese shopfloor systems can be used in SA. We thus have three aims in mind for this research:

1. To document the implementation experiences in the plants
2. To evaluate the effectiveness of the training
3. To be able to advise the Department of Trade and Industry about the possibilities of sponsoring such training.

Please be accurate in your responses. It is important that the results of this research reflect the truth as closely as possible.

Thank you !!

COMPANY INFORMATION:

1. Name of company _____

2. Your position in the firm _____

3 a) number of shopfloor employees _____
b) number of non-shopfloor employees _____

4. Product manufactured? _____

5. Type of manufacturing (circle 1 or more) Job shop/ Assembly/ Batch/ Cellular

INFORMATION ABOUT THE BEST PRACTICE WORKSHOP:

6. Why was it decided to send a team (person) on the workshop? _____
_____

7. Who decided to participate in the workshop? _____

8a. What were your expectations of the training? _____
_____

8b. Were your expectations met? If so how, if not why? _____
_____

9. On what basis were the participants chosen and why? _____
_____

10. Have you noticed any changes since the people attended the workshop? Yes/ No. Explain:
_____
_____

11a. Did the participants report back on the workshop on their return? Yes / No

11b. If so, what was the main message which they brought back? _____
_____

12a. Was someone appointed to manage the trainees and the implementation of what they learnt? Yes / No

12b. Was this person appointed prior to or following the workshop? _____

13. What other training has been offered in these areas (e.g. productivity, teams etc...) ?

14a. Is there a deliberate improvement drive in the plant? Yes / No

14b. If so, when was it launched? _____

14c. If the programme has a name, what is it called? _____

15a. Has there been any opposition to the new initiatives? Yes / No . If yes, from which stakeholders? _____

15b. What are the main concerns which have been expressed? _____

16. What is the plants NOSA rating? _____

17. Are you listed for ISO? If so, which one? _____

18a. What are the things that this plant needs to be good at in order to meet the competition? (rank in order of importance)
1. _____ 2. _____ 3. _____ 4. _____ .

18b. Are shopfloor employees aware of these priorities? Yes / No / Some

19. Do you consider continuous improvement to be a key to success in your plant?

20a. Do shopfloor employees practice housekeeping in their work area? Yes / No / Some

20b. If yes, is it the 5S method or another? 5S / Other

21. Are things on the shopfloor marked for easy visual identification? Yes / No / Some (e.g. by colour coding, easy to read labels etc...).
Example: _____

22. Do you operate according to Kanban (JIT) within the plant? Yes / No / Some

23. Do you have quality at source? Yes / No / Some

24a. Are the shopfloor employees multi-skilled ? Yes / No

24b. If no, is this an objective in the future ? Yes / No

25. Do employees engage in preventative maintenance? Yes / No / Some

26. Is production procedure information displayed at the work stations? Yes / No / Some

27a. Are shopfloor operators recording production performance data? Yes / No / Some

27b. Which recording methods are used? Forms / Checklists / Graphs / Other

28a. Is production performance data communicated to the shopfloor employees? Yes /No

28b. If yes, what performance areas are communicated? (e.g. production targets, actual targets, rejects)

_____

28c. Are shopfloor employees able to see in the middle of a shift whether they are on target? Yes / No

29a. Are shopfloor employees involved in identifying production problems ?
Yes / No / Some

29b. Which problem identification methods are used ?
Pareto Chart / Control Chart (80/20 rule) / (SPC) Other / None

30a. Are shopfloor employees involved in problem solving? Yes / No / Some

30b. Which shopfloor employees are mostly involved in problem solving ?

_____

30c. What kind of production problems do they deal with ? _____

_____

30d. Which problem solving methods are used ?
ask why 5 times / Cause and effect diagrams
(Root cause analysis) (Fishbone diagrams), Other _____

31. Are solutions to production problems incorporated into the way shopfloor employees work? Yes/ No / Some

32. Do you have standard operating procedures in the plant? Yes / No / Some

33. Do shopfloor employees follow the SOP's Yes / No / Some

34. Are there productivity related incentives and how do they work ?

35. Have any changes been made to the corporate hierarchy? Yes / No
if yes, explain? _____

36. What are the main training priorities? _____

_____

37. Is there career pathing for shopfloor employees ? Yes / No / Some

38. What grading system is used in the plant? _____

39. Any further comments related to the Best Practice Initiative training workshop? _____

40. Any further comments related to implementation following the workshop?

THANK YOU FOR TAKING THE TIME TO FILL IN THIS QUESTIONNAIRE.

TEAM ..... DATE ..... PARTICIPANTS ..... FACILITATOR .....

Appendix 3

Problem Solving Sheet from a participant company

1 IDENTIFY THE PROBLEM THAT MUST BE SOLVED

1.1 What is the object, thing, machine or product that you have a problem with ? Phosphoric Acid

1.2 Can you be more specific about the object thing or product ? .....

1.3 What is the problem (wrong) with this object/thing/product ? .....

1.4 What caused this problem or defect ?

WHY ..... (evidence)

WHY ..... (evidence)

WHY ..... (evidence)

WHY ..... (evidence)

WHY ..... (evidence)

4 TEST FOR MOST PROBABLE CAUSES

1 IF..... is the cause, how does it explain that the problem is at/on →

2 IF..... is the cause, how does it explain that the problem is →

3 IF..... is the cause, how does it explain why the problem started on →

4 IF..... is the cause, how does it explain why the problem only occurred on →

5 IF..... is the cause, how does it explain why the problem only occurred during →

6 IF..... is the cause, how does it explain that the problem is at/on →

2 DESCRIBE THE PROBLEM

1 What do you have a problem with ?
_____ AND NOT AT/ON _____

2 What is wrong ?
_____ AND NOT _____

3 When was the problem first noticed ?
_____ AND NOT BEFORE

4 Was the problem noticed again ? (Is there a pattern - give dates and/or times)
_____ AND NOT OTHER TIMES

5 When during the operation / process is the problem observed ?
_____ AND NOT _____

6 Where is the problem located on the object ?
_____ AND NOT _____

5 VERIFY MOST PROBABLE CAUSE(S)

.....

.....

.....

.....

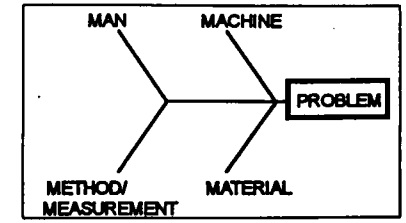
.....

.....

3 GENERATE POSSIBLE CAUSES

WHAT HAS CHANGED +

(What has been serviced, maintained, repaired, modified or improved)



	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						

6 BE PRO-ACTIVE AND CLOSE THE LOOP

6.1 WHAT HAS CAUSED THIS CAUSE DO YOU HAVE EVIDENCE .....

6.2 SELECT AND IMPLEMENT THE BEST SOLUTION .....

6.3 THINK BEYOND THE FIX (REFER LOOP CLOSING GUIDE) .....

6.4 CLOSE LOOPS (REFER LOOP CLOSING GUIDE) .....

6.5 EVALUATE SOLUTION .....

Appendix 4

The implementation of Continuous Improvement in companies

4.1 Stages in the Evolution of Continuous Improvement Capabity
(Table 3, Bessant & Caffyn, 1996: p. 11)

4.2 Enablers for Continuous Improvement (Table 4, Bessant & Caffyn, 1996: p. 13)

4.1 Stages in the Evolution of Continuous Improvement Capability (Table 3, Bessant & Caffyn, 1996: p. 11)

Stage 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 for mechanisms, timing, etc., devolved to problem-solving unit High levels of experimentation
5) Full CI capability — the Learning organisation	CI as the dominant way of life Automatic capture and sharing of learning Everyone actively involved in innovation process Incremental and radical innovation

4.2 Enablers for Continuous Improvement

(Table 4, Bessant & Caffyn, 1996 :p. 13)

Behaviour/routines	Blockage	Enablers
Getting the CI habit	No formal process for finding and solving problems	PDCA or similar structural model plus training
	Ideas are not responded to	Simple idea management system, based on rapid response
	Lack of skills in problem-solving	Training in simple CI tools — brainstorming, fishbone techniques, etc.
	Lack of motivation	Recognition system
	No structure for CI	Simple vehicles, based on groups
	Lack of group process skills	Facilitator training
Focusing CI	No strategic impact of CI	Focus problem-solving on strategic targets/policy deployment
Spreading the word	Lack of co-operation across divisions	Cross-functional CI teams
	Lack of process orientation	Process modelling tools and training
Walking the talk	Conflict between espoused and practised values	Articulation and review
The learning organisation	No capture of learning	Post-project reviews Story-board techniques Encapsulation in procedures
Continuous improvement of continuous improvement	Lack of direction	Formal CI steering group and strategic framework
	Running out of steam	Regular CI review and re-launch

Appendix 5

Detailed Overview of the 5S System

5. A 5S overview

(Table 3.1, Osada, 1996: p.37)

TABLE 3.1. A 5S overview.

	Meaning	*Aims*	*Activities*	*Principles*
Organization (*Seiri*)	Distinguishing between the necessary and the unnecessary, and getting rid of what you do not need.	• Establish criteria and stick to them in eliminating the unnecessary. • Practice stratification management to set priorities. • Be able to deal with the causes of filth.	• Eliminating the unnecessary. • Dealing with the causes of filth. • *Kaizen* and standardization based on fundamentals.	Stratification management and dealing with the causes.
Neatness (*Seiton*)	Establishing a neat layout so you can always get just as much of what you need when you need it.	• A neat looking workplace. • Efficient (including quality and safety) layout and placement. • Raising productivity by eliminating the waste of looking for things.	• Functional storage based upon the 5W's and the 1H. • Practice and competition in putting things away and getting them out. • Neaten workplace and equipment. • Eliminating the waste of looking for things.	Functional storage and eliminating the need to look for things.
Cleaning (*Seiso*)	Eliminating trash, filth, and foreign matter for a cleaner workplace. Cleaning as a form of inspection.	• A degree of cleanliness commensurate to your needs. Achieving zero grime and zero dirt. • Finding minor problems with cleaning inspections. • Understanding that cleaning is inspecting.	• 5S's where it counts. • More efficient cleaning. • Cleaning and inspecting equipment and tools.	Cleaning as inspection and degrees of cleanliness.
Standardization (*Seiketsu*)	Keeping things organized, neat, and clean, even in personal and pollution-related aspects.	• Management standards for maintaining the 5S's. • Innovative visible management so that abnormalities show up.	• Innovative visible management. • Early detection and early action. • Tools (e.g., manuals) for maintaining standardization. • Color coding.	Visual management and 5S standardization.
Discipline (*Shitsuke*)	Doing the right thing as a matter of course.	• Full participation in developing good habits and workshops that follow the rules. • Communication and feedback as daily routine.	• One-minute 5S. • Communication and feedback. • Individual responsibility. • Practicing good habits.	Habit formation and a disciplined workplace.

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