

https://dspace.org/

The implementation of the "Just-in-Time" manufacturing philosophy into the South African furniture industry

Azzie, Maurice Michael

2014-10-16
http://hdl.handle.net/10539/15746

Downloaded from a DSpace repository. https://dspace.org/

THE IMPLEMENTATION OF THE "JUST-IN-TIME" MANUFACTURING PHILOSOPHY INTO THE SOUTH AFRICAN FURNITURE INDUSTRY

Maurice Michael Azzie

A project report submitted to the Faculty of Engineering, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the Degree of Master of Science in Engineering.

Johannesburg 1988.

In loving memory of my brother

Brendan Dennis Azzie

1969 - 1988

May God let perpetual light shine upon him.

DECLARATION

I declare that this project report is my own, unaided work. It is being submitted in partial fulfillment of the requirements for the Degree of Master of Science in Engineering in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any Degree or Examination in any other University.

Maurice Michael Azzie.

FIRST day of JULY, 1988.

ABSTRACT

This project report considers the implementation of the "Just-in-Time" manufacturing philosophy into the South African furniture industry. The aims of the research were :-

1) To analyse the industry in terms of its productivity, its present state of awareness of JIT and its attitudes towards JIT implementation.
2) To provide a detailed case study of the Just-in-Time implementation program followed by one furniture manufacturer as a guide for others following in order to encourage implementation.

The South African furniture industry is currently one of the weakest industries in the country as regards productivity, return on investment and value added per employee. Most manufacturers are unaware of the industry's poor progress and few manufacturers have attempted formal productivity improvement programs.

The research included a survey of ten large furniture producers all geographically located in the greater Witwatersrand area.

The JIT concept is new to the industry and to date has only been attempted by three of the 868 registered furniture manufacturers. The majority of companies in the industry are unaware of the philosophy or are not committed to it.

The report details, in a case study, the successful implementation program at A.F. Dreyer & Company. From experience gained during the course of implementation at this company four

key factors were identified which would improve implementation success, if correctly applied. These factors were :-

- management commitment and style
- the management of change
- education and training
- employee involvement.

The implementation program at A.F. Dreyer followed a "Pilot project" type approach. The major benefits of the project included reductions of up to 97% in WIP on the shop floor in some areas, reductions of assembly leadtimes of up to 90%, reductions of up to 65% in flowline legnths and a reduction of 20% for the number of direct labourers required. The benefits noted were however localized to specific areas in the plant and are not general plant improvements.

ACKNOWLEDGEMENTS

Most of all I would like to thank my family, Mom, Dad, Kevin, David, Brendan, Christopher and Bernadette, and my friend and companion, Michelle, for their invaluable help and support.

I thank especially :
My supervisors, Professor John Bicheno and Mike Karle for their guidance,

Andre Dreyer and the managers and employees at A.F. Dreyer & Company who helped with the implementation of JIT at that company,

Those owners, managers and employees of the surveyed companies who gave of their time to provide the information on which some of this work is based,

Raimond Immelman of the NPI Furniture Unit who helped in the analysis of productivity of the South African Furniture industry,

Michelle Broekaert for her fine typing and endless time and patience.

CONTENTS

	Page
DEDICATION	i
DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGMENTS	v
CONTENTS	vi
LIST OF FIGURES	x
LIST OF PRINTS	xi
LIST OF TABLES	xiii
NOMENCLATURE	xiv
LIST OF PROFESSIONAL BODIES AND INSTITUTIONS	xv
LIST OF TRADE UNIONS	xv
1.0 INTRODUCTION	1
2.0 JUST IN TIME IMPLEMENTATION	8
2.1 The Just in Time philosophy	8
2.2 The dependence of JIT on people	11
2.3 JIT in South African manufacturing	13
2.3.1 A South African developed framework for implementation	13
2.3.2 Recent developments	15
2.3.3 JIT in the furniture industry	16
2.4 The South African labour force	17
2.4.1 Unrest	17
2.4.2 Strikes and JIT	18
2.4.3 Education	19

2.4.4 Pluralism 21

3.0 THE SOUTH AFRICAN FURNITURE INDUSTRY 23

3.1 Historical note 23
3.2 The industry's position in the economy 24
3.3 Some important developments in the industry..... 26
3.4 The Just in Time survey 32
3.4.1 Introduction 32
3.4.2 Questionnaire results 35
3.4.3 A discussion of the survey results..... 41
3.5 An overview of furniture production facilities and systems 53

4.0 THE ROAD TO IMPLEMENTATION FOLLOWED BY A.F. DREYER - A CASE STUDY 58

4.1 Introduction to A.F. Dreyer and Company 60
4.2 Problem definition 62
4.2.1 Problem statement 62
4.2.2 Requirements 62
4.2.3 Constraints 63
4.2.4 Criteria 63
4.3 The JIT steering commitee 63
4.4 JIT implementation schedule 64
4.5 The pilot projects 65
4.5.1 The bedroom suite line 67
4.5.2 The kist line 72
4.5.3 The Kanban card pilot project 81

4.6 Spinoffs from the pilot projects 88

4.6.1 Product and component rationalisation ... 88

4.6.2 Sanding shop project 91

4.6.3 Quality circles, problem solving and creative involvement 91

4.6.4 Preventative maintenance 95

4.6.5 The Kanban trolley system 95

4.6.6 Housekeeping and visibility 99

4.7 The strike and its impact 103

4.8 The development of a GT machine shop 105

4.8.1 The group technology concept 106

4.8.2 The development of cells 107

4.8.3 The three dimensional scale model 113

4.9 An evaluation of the implementation schedule 116

5.0 PROMINENT IMPLEMENTATION ISSUES 119

5.1 Management commitment and style 120

5.2 The management of change 123

5.3 Education and training 126

5.4 Employee involvement 130

6.0 CONCLUSIONS 134

7.0 REFERENCES 143

8.0 BIBLIOGRAPHY 154

APPENDICES

APPENDIX A LIST OF INTERVIEWEES A1

APPENDIX B QUESTIONNAIRE ON JIT AWARENESS AND IMPLEMENTATION ISSUES IN THE S.A. FURNITURE INDUSTRY A2

APPENDIX C PRODUCT QUANTITY CHARTS AND MONTHLY PRODUCTION AVERAGES A7

C1 Total assembly shop data A7

C2 Kist assembly data A8

C3 Headboard assembly data A9

C4 Stool assembly data A11

C5 Dressing table assembly data A13

C6 Display assembly data A15

C7 Table and Miscellaneous assembly data . A16

C8 Robe assembly data A17

C9 TV Video cabinet assembly data A19

C10 Desk assembly data A20

APPENDIX D FLOW PROCESS CHARTS A21

D1 Original flow process chart A22

D2 Improved flow process chart A23

APPENDIX E PLANT LAYOUT AS AT FEBRUARY 1987 ..... A24

APPENDIX F PROPOSED GT PLANT LAYOUT A28

LIST OF FIGURES

FIGURE NUMBER	TITLE	PAGE
1	The techniques of JIT.....	10
2	The vehicle - Stage 1.....	13
3	The driver - Stage 2.....	14
4	The head - Stage 3.....	14
5	Loss of man-days as a result of strikes.....	18
6	Labour productivity growth rates 1976 - 1985.....	25
7	Consumer expenditure on furniture as a percentage of total expenditure.....	27
8	Sales in furniture as a percentage of total sales in manufacturing.....	28
9	Unit labour costs in manufacturing and furniture.....	29
10	Actual value of sales and real sales in furniture.....	30
11	Number of establishments in furniture as a percentage of total manufacturing establishments.....	30
12	Number of manufacturing employees in the residential furniture industry.....	31
13	Product-process matrix of surveyed companies.....	43
14	JIT implementation schedule.....	65&116
15	Junior kist assembly line.....	76
16	The Kanban trolley system.....	96

LIST OF PRINTS

PRINT NUMBER	TITLE	PAGE
1	Completion of 500 kist shelf trays.....	73
2	Final fitting of a large lot of kists.....	74
3	Old kist assembly zone.....	77
4	New kist assembly zone.....	78
5	Large lot of kists from assembly to polishing.....	79
6	Sanding shop after JIT implementation on kist assembly line.....	79
7	The Kanban square principle in action.....	80
8	The first Kanban cards.....	83
9	Stage 2 Kanban card.....	84
10	Damaged Kanban card.....	85
11	Stage 3 Kanban card.....	86
12	Colour coded Kanban board.....	87
13	"Blank" supports and associated Kanban cards.....	90
14	Headboard jig with "waste saving padding.....	92
15	Headboard jig in use.....	92
16	Redesigned countersinking drill bit.....	93
17	Drawer press - open.....	94
18	Drawer press - closed.....	94
19	Red Kanban trolley with stage 2 Kanban card..	97
20	Two red Kanban trolleys at polish line.....	98
21	Poor housekeeping in a veneer cutting area...	99
22	Poor housekeeping in a padding store.....	99
23	Two workers discussing quality in a tidy environment.....	101

24	Solid breakout planning desk, jigs and Kanban board	101
25	Chart showing production activity on the headboard line	102
26	Table showing production activity in the spray shop	102
27	Chart showing target and actual final assembly schedules	103
28	Leg shaping group technology cell	109
29	Plan view of cellular layout	112
30	Plan view of the U-V line	114
31	Plan view of the kist assembly line	115

LIST OF TABLES

TABLE NUMBER	TITLE	PAGE
1	Summarized questionnaire results.....	36
2	Improvements to headboard pilot project.....	71
3	Comparison of process flowcharts.....	74
4	Actual improvements on the kist line.....	81
5	Summary of Kanban implementation.....	88

NOMENCLATURE

ABC Analysis	- Inventory classification system which grades inventory according to its value and usage patterns
BOM	- Bill of Material
EI	- Employee Involvement
GT	- Group Technology
IR	- Industrial Relations
JIT	- Just-in-Time
MPC	- Manufacturing Planning and Control
MPS	- Master Production Schedule
MRP	- Materials Requirements Planning
PM	- Preventative Maintenance
QC's	- Quality Circles
TPM	- Total Productive Manufacturing
TQC	- Total Quality Control
WCM	- World Class Manufacturing
x/y	- When referring to survey results, the author has used this format e.g. 7/10 means seven out of ten companies

LIST OF PROFESSIONAL BODIES AND INSTITUTIONS

APICS	- American Production and Inventory Control Society
CEE	- Continuing Engineering Education
FITB	- Furniture Industry Training Board
FMA	- Furniture Manufacturers Association
FTA	- Furniture Traders Association
NPI	- National Productivity Institute
SABS	- South African Bureau of Standards
SAIIE	- South African Institute of Industrial Engineers
SAPICS	- South African Production and Inventory Control Society

LIST OF TRADE UNIONS

COSATU	- Congress of South African Trade Unions
FWU	- Furniture Workers Union
MAWU	- Metal and Allied Workers Union
PWAWU	- Paper Wood and Allied Workers Union

1.0 INTRODUCTION.

"Japan, quality and productivity are three common words in the field of manufacturing management today. A simple explanation of this fact is that the Japanese manufacturing sector produces the highest quality (conformance to specification) products in many industries. Simultaneously, Japan is showing an extraordinary productivity growth rate among major industrialized nations worldwide. From 1960 to 1980, Japan's average annual growth rate of productivity in manufacturing was 9.3% as compared to 2.7% in the United States." [1] This outstanding productivity improvement may be closely associated with Japanese manufacturing techniques, the most publicized of which is Just-in-Time (JIT). [2]

"Just-in-Time is a disciplined approach to improving overall productivity through the elimination of waste. It provides for the cost effective production and delivery of only the necessary, quality parts, in the right quantity, at the right time and place while using a minimum of facilities, equipment, materials and human resources." [3]

The above definition describes the goals of the philosophy however it neglects to mention one of the most critical aspects of the system, that of Employee Involvement otherwise known as EI. Just-in-Time is thus better defined as; "A manufacturing strategy of continuous improvement through the elimination of all non value adding wastes, and achieved through the total creative involvement of all employees." [4]

In its broad sense Just-in-Time is a manufacturing philosophy and

strategy for survival growth and excellence, through improved productivity and quality, but it is based on the fundamental principle of respect for people and the value of harnessing the creative and problem solving abilities of all employees.

JIT alias Stockless Production alias Zero Inventories has become a new way of life among world class manufacturers. The approach cannot successfully be described as a manufacturing planning and control system only. JIT is this and a substantial amount more. It is a philosophy. It is a philosophy that enhances good manufacturing management, operational discipline, consistency, and teamwork, within all spheres of business management.

"When the Japanese advantage of producing high quality goods at low cost was first noticed, credit was given to the Japanese culture and strong work ethic. Attention was then given to differences in personnel practices, including factors such as lifetime employment, multifunction workers, collective decision making, implicit control mechanisms and government policy. Study groups that were sent to Japan from the USA had preconceived notions that the meaningful differences between Japanese and Western manufacturing were cultural and environmental. After a visit, 24 General Electric executives admitted that the real differences might be described as good manufacturing management, operational discipline, consistency and teamwork." [5]

In contrast to Japan's excellent productivity track record mentioned above , South Africa's situation has been bleak to say the least. In the last four years, our manufacturing contribution to gross domestic product has shrunk by about 1% against a growth

target of 4% to 5% per year as set in the White Paper on industrial growth strategy. [6] Figures obtained from the National Productivity Institute indicate that between 1981 and 1986, manufacturing productivity dropped at an average rate of 2% per year. [7] This coupled with a production price index growing at about 20% per year [8] and world trade sanctions has made it increasingly difficult for South African products to even reach world markets let alone compete in them.

"We are moving into the knowledge intensive 1990's where people are going to make more money from knowledge, and less from raw materials. Even with the fairly generous assumption that gold production would remain at current levels until the turn of the century, South Africa could face a widening current account deficit from the mid-1990's onwards. That is, unless it does something now to create the right environment in which other export industries are developed such that some of them will turn into major foreign exchange earners by the late 1990's." [9]

It is the authors view that manufacturing could be that "major foreign exchange earner" described by Clem Sunter in his book "The World and South Africa in the 1990's". In order that this "dream" materialize, as it did in Japan, it is imperative that South African manufacturers come to terms with the requirements of becoming World Class Manufacturers.

Many South African manufacturers have in fact realized the importance of improving their performance and have started down the long road towards WCM status. Companies such as Rowen Engineering, Toyota South Africa, Afrox Gas Equipment, GEC Small

Machines, Fedmech, Promex, John Deere, Bosch, Dresser S.A. and WJ Engineering have all started implementing the Just-in-Time philosophy with the aim of improving their manufacturing performance.

The author, who has been involved in the design and implementation of JIT systems in the South African furniture industry since April 1986, views the industry as a discreet product industry with units being produced in relatively high volumes and as such he sees it as an ideal environment for the application of the Just-in-Time manufacturing philosophy. The author is however aware of only one furniture manufacturer (Anglo Dutch) nationwide that had attempted to implement Just-in-Time before 1987. Unfortunately the implementation effort at this company lasted only two years and little progress had been made before the attempt was abandoned. A summary of this companies implementation efforts are presented in the report. In addition an interview was conducted with the production manager to identify the reason for the failure.

This project report considers the implementation issues of Just-in-Time manufacturing in the South African furniture industry. The research that was carried out had two basic aims:-

1) To analyze the industry in terms of its productivity, its present state of awareness of JIT and attitudes towards the implementation of JIT in the industry;
2) To provide a detailed case study of the road towards Just-in-Time followed by one furniture manufacturer as a "how to" guide for others following in an attempt to improve future implementation success.

In the attempt to meet these two basic aims the research identified some key factors which contribute towards successful implementation, as well as some critical issues which may suffocate the successfulness of the philosophy if not carefully handled.

In an attempt to maintain a holistic view of Just-in-Time implementation it was deemed necessary and desirable to include a primary chapter discussing JIT within the South African environment. "When implementing change in a dynamic environment, it is of fundamental importance to analyze, not only the change program itself, but also the environment of change in its broader sense. No management practice in South Africa can be evaluated in isolation from the overall business and socio-political scenario." [10]

Chapter 2 thus considers the wider implications of Just-in-Time implementation in the South African environment. This chapter introduces Just-in-Time and the present state of the environment in which it is to be implemented. Since there are countless texts which cover the Just-in-Time techniques little emphasis is placed on the description of the actual JIT techniques within this chapter or those following.

Chapter 3 presents an analysis of the present state of awareness of Just-in-Time and attitudes towards the implementation of JIT in the industry. In addition it provides an outline of the operating characteristics of the industry which are both different to other industries and are relevant to Just-in-Time implementation. In order to obtain input for discussion under

this heading a survey was conducted.

The survey involved researching ten different furniture producers all physically situated within the greater Witwatersrand area. Two of the surveyed companies had started down the long road to Just-in-Time production during 1987. One company had attempted JIT implementation but had abandoned the effort after 2 years in June 1987. Of the remaining seven, three were totally oblivious to the philosophy, and four were aware of, but not committed to it.

For further input the author also conducted an interview with the senior project manager of the National Productivity Institutes' Furniture Production Unit in Pretoria.

Chapter 4 presents a detailed case study which discusses the design and implementation of a Just-in-Time system at A.F. Dreyer and Company. The author was employed as a part-time JIT consultant at this furniture manufacturer between February 1987 and February 1988. The case study documents the work carried out, in an attempt to guide other companies wishing to follow. In addition to detailing the actual implementation progress made during the period, the case study provides a set of guidelines for future implementation plans. Chapter 4 provides an evaluation of the manufacturing plant and its associated informal MPC system prior to JIT implementation, it presents a description of the application of the JIT philosophy in the design of an appropriate layout which was developed after extensive research into product flow quantities, routing information, bills of materials, man and machine resource availability and capacities. Finally the

chapter considers the implementation procedures and management related issues which were predominant during initial implementation.

In addition to the written word, the case study also presents a 1:85 scale model of the A.F. Dreyer Just-in-Time "factory of the future". Since duplicates of the considerably sized, 3-dimensional model would be time consuming to produce, detailed photographic prints are provided in the text. It is however advisable to study the model to fully appreciate the advantages of the developed Group Technology and Assembly Line type layout.

Chapter 5 considers the most prominent implementation issues that emerged during the implementation of Just-in-Time at A.F. Dreyer. This chapter is intended to prepare and introduce other Just-in-Time implementors to the probable problem areas of implementation. This section discusses the following issues :-

- Management commitment and style.
- The management of change.
- Education and training.
- Employee Involvement.

The above issues are presented in an attempt to clarify their importance and provide the implementor with a short guide as to how these issues could be approached.

2.0 JUST-IN-TIME IMPLEMENTATION.

2.1 The Just-in-Time Philosophy.

The philosophy of Just-in-Time manufacturing is embodied in the Japanese statement "Avoid muri, muda and mura" which means the elimination of excess, waste and unevenness. It is based on an insistence that one must approach perfection in quality and eliminate the need for buffer inventories that mask quality problems and reduce productivity.

Implementing JIT is a formidable challenge. It is not a "pink pill" or a "quick fix". A top management decision to adopt Just-in-Time represents a commitment to massive organizational change, from business strategy through daily operating procedures, from the way the product is designed through the way it is distributed, from the way corporate performance is measured through the way individual workers are evaluated. [11]

"Just-in-Time techniques can pave the way for more repetitive less irregular production. As the term suggests, Just-in-Time shrinks lead time. It also shrinks space, distance, time lag between when an error is made and when it is found, and inventories. The most obvious visible results of Just-in-Time may employ changes in equipment, plant layout, vendor selection, freight arrangements, material handling, quality control, work procedures, scheduling, labour training, labour assignments, and the role of staff experts - in addition to changes directly affecting inventories. Just-in-Time may be thought of as a system of enforced problem solving. In the Just-in-Time

environment of minimal inventories, problems in equipment, plant layout, vendor selection and the rest of the above list have to be solved or production comes to a halt for lack of parts." [12]

It is not the purpose of this work to discuss the many techniques used by Just-in-Time, but rather to discuss implementation considerations of Just-in-Time in the South African Furniture Industry. It is however necessary for the implementor of the Just-in-Time system to be aware of the many techniques available to him and the benefits which he may expect. In order that there may be a good foundation for implementation it is expected that the Just-in-Time "Champion" or head implementor is both aware of, and familiar with, the techniques which are presented in Figure 1 and how these techniques interrelate.

"World Class Manufacturing", or the ability to produce products with price, quality and delivery characteristics equal to the worlds best, is built on four pillars: Just-in-Time production, Total Quality Control, Total Productive Maintenance and Employee Involvement. [13] Any three cannot function synergistically without the fourth. All four must be employed to attain the full benefits of the system, however the area of Employee Involvement is seen as critical for the implementation of JIT.

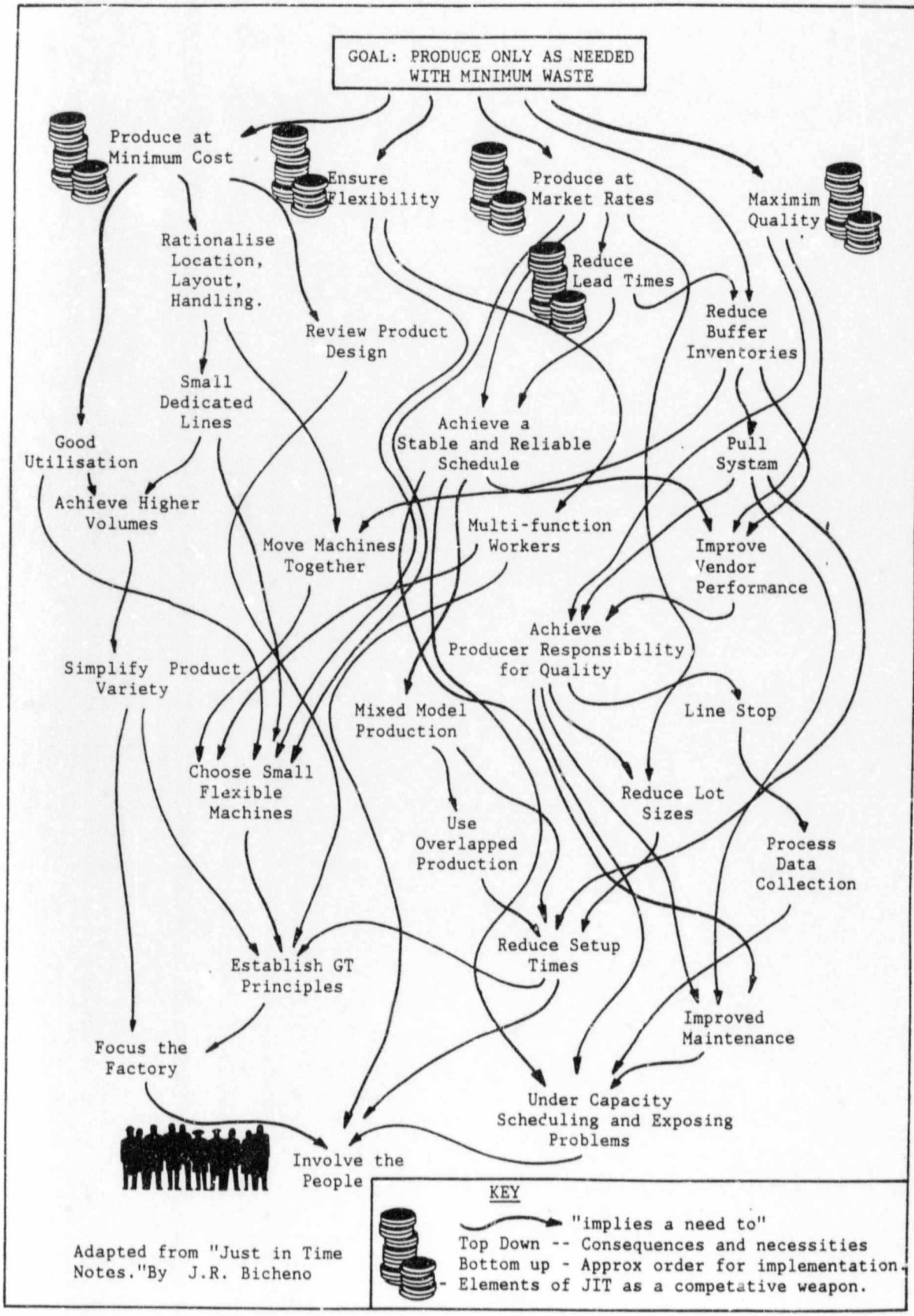


FIGURE 1: The Techniques of Just-in-Time.

2.2 The Dependence Of JIT on People.

Schonberger [14] has compiled an "Honour Roll" which he calls the "5-10-20's". This is a list of American based companies which have achieved 5, 10 and 20 fold improvements in some area of manufacturing due to the implementation of Just-in-Time into the companies. At the time of publishing his book "World Class Manufacturing" in 1986 there were close to 100 different companies on this honour roll. This list indicates that JIT is certainly not based on the Japanese culture, although in some instances their culture does support the philosophy. [15] JIT is a management technology and Schonberger [16] in his first book Japanese Manufacturing Techniques indicates that "Management Technology is a highly transportable commodity." He points out that it is dependent on people involvement and not on culture.

"The implementation of JIT in Western companies is recognized widely as having very significant benefits. However as companies rush to implement JIT, difficulties arise mainly due to the narrow focus of inventory reduction. A more integrative view of the basic concepts behind JIT activities, (and thus the techniques indicated in Figure 1), is required for successful implementation. Recognizing a pattern in the problems arising during JIT implementation in many companies in the U.S.A., Canada and Europe, and comparing it to the implementation process in Japanese companies, the role of worker participation is viewed as a foundation of successful JIT implementation." [17]

Arthur Young and Company, a management consulting practice in Los Angeles cite four prerequisites to JIT production. These are;

education, commitment from all, expert guidance and employee involvement. [18] Landis [19] believes that the most important issues are education, commitment from all, participative management management support and employee involvement. According to Hall [20] successful implementations involve three elements: people; physical process reorganization; and systems, in that order.

It is almost a futile battle if worker participation is not enlisted in the implementation program. If the operators understanding and involvement are not secured, the improvements simply will not work: Kanban cards will be lost frequently; New work procedures introduced may be ignored; Better housekeeping will not be practiced; etc. The system makes it possible but the people make it happen, and thus the role of shop floor workers cannot be overemphasized.

Virtually all Just-in-Time specialists regard Employee Involvement as crucial to implementation success. This is of particular importance to the implementation of Just-in-Time in South Africa due to the nature of Management/Worker relationships in this country. The importance of both the management style and the pluralistic scenario in the South African labour force will be discussed under section 2.4 which relates directly to the South African labour force.

2.3 Just-in-Time In South African Manufacturing.

2.3.1 A South African Developed Framework for Implementation.

Bicheno [21] presents a framework for successful JIT implementation in his Vehicle-driver model. In the first stage, the techniques applied are concerned with preparing the facility and the product for : - High Quality
- Low Cost
- Minimum Lead Time
- High Flexibility (see Fig. 2)

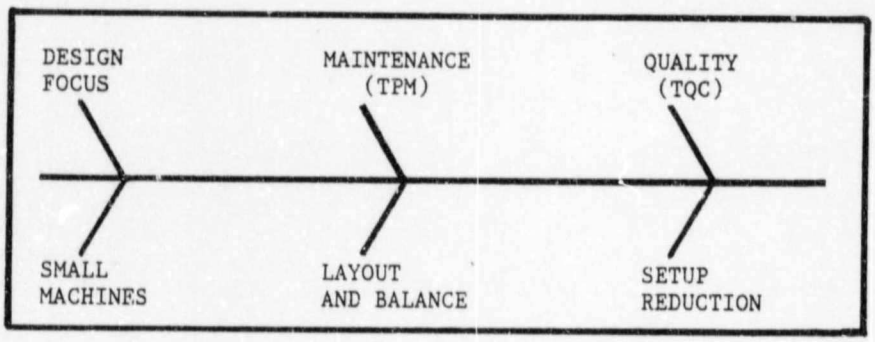


FIGURE 2: The Vehicle - Stage 1.

The second stage concerns the implementor with "Those processes that are necessary to produce :- Only as needed
- With perfect quality
- At minimum cost " [22] (Fig.3)

Bicheno also points out that the techniques presented in the driver stage are fairly ineffective unless a fair amount of progress has been made in the first stage.

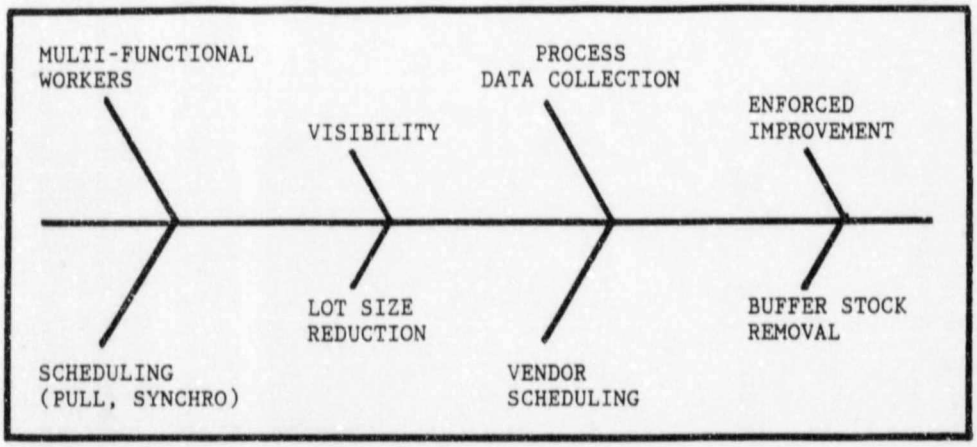


FIGURE 3: The Driver - Stage 2.

It is felt by Nestadt [23] that this model is incomplete in that it does not consider the keystone of Employee Involvement. Nestadt [24] expands on Bicheno's "Vehicle-driver" model by proposing that people/human involvement steers the "driver-vehicle" at it's head. He emphasizes that training provides the human head with the knowledge to steer the vehicle, and that, he believes is the key to implementation success. (See Fig. 4)

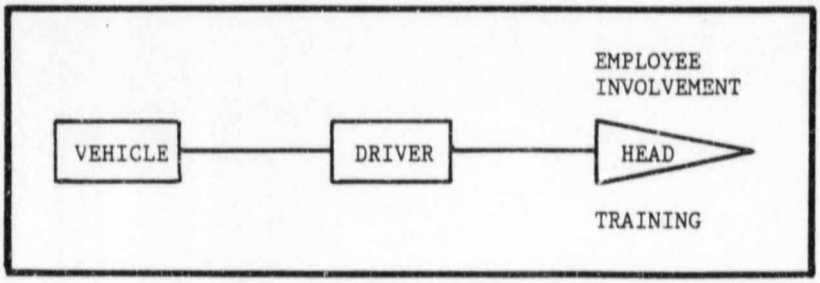


FIGURE 4: The Head - Stage 3.

It is believed by the author that the issues of Employee Involvement and training are a primary and critical part of Just-in-Time implementation. Bicheno's model considers the preparation of the facility and the product for the changes towards JIT, but it does not consider the preparation of the people, which must be a primary consideration for successful implementation.

2.3.2 Recent Developments.

In order to provide an overview of the introduction of JIT to South African manufacturing a brief summary of recent developments is necessary.

Professor John Bicheno, formerly Associate Professor of Industrial Engineering at the University of the Witwatersrand has played a key role in the Introduction of the Just-in-Time concepts in South African Industry. In addition to John Bicheno there have been numerous other "JIT experts" applying JIT principles to the South African Manufacturing Sector. These include William Wheeler III brought to South Africa by Coopers & Lybrandt, George Plossl of Plossl & Johnson and Hal Mather, Richard Walleigh and William Sandras Jr. brought to South Africa from U.S.A. by Hewlett-Packard S.A.

Between August 1985 and November 1986 Professor Bicheno presented the JIT concept to over 600 people of the general public in a series of evening lectures. [25]

"Four papers on JIT were presented at "The First Wits Industrial

Engineering Conference", held on the 11 - 12th February 1986". [26] "The Second Wits Industrial Engineering Conference" saw the presentation of a further six JIT papers. At the Second International Conference on Just in Time Manufacturing held in London during October 1987 four South African speakers presented papers on various aspects of Just in Time and its implementation.

"SAPICS, The South African Institute of Industrial Engineers and the NPI are all promoting JIT within their own spheres. Several consultants have set up JIT specializations, often with an overseas link to provide basic materials. The Government and government related bodies, as yet, have hardly begun to recognize JIT. This is a pity because the JIT concept is probably the greatest opportunity South Africa has for improving it's manufacturing productivity. South Africa needs to emulate and even better the Australian Government program of encouraging JIT through grants, demonstration projects and relevant research." [27]

2.3.3 JIT In The Furniture Industry.

With particular reference to JIT in the furniture industry, only 3 companies have been involved in implementation. The first was Anglo Dutch office furniture for whom 3 undergraduate projects for Wits University were completed. Unfortunately after a consolidation with Duncan Bayne, another furniture manufacturer, Anglo Dutch lost it's impetuous for growth in JIT and the JIT effort collapsed early in 1987. This implementation failure is clarified in Chapter 3. The two other companies are Krost Brothers and A.F. Dreyer & Co. Both of these companies are

privately owned furniture manufacturers. The Just-in-Time program started in February 1987 at A.F. Dreyer, and in June 1987 at Krost Brothers. The two companies manufacture different ranges of furniture for different markets and do not compete in any way. Both of the companies as well as Anglo Dutch and Duncan Bayne are included in the survey which is presented in Chapter 3.

2.4 The South African Labour Force.

2.4.1 Unrest.

The successful application of Just-in-Time in South Africa is dependent upon the preparation of the workers for the changes that will result. This is especially important within the South African environment for two primary reasons :-

1) The South African labour situation is currently in a state of crises.
2) There is an inextricable link between shop floor politics and politics on a national scale.

"Since August 1984, South Africa has experienced the most prolonged and widespread black civil unrest in it's history. The South African economy entered a major recession late in 1981, experienced two consecutive years of declining gross domestic product in 1982 and 1983, and enjoyed only a brief upswing from mid 1984 (due to a rocket in the international gold price) before resuming the downward trend." [28] Crippled by the socio-political unrest resulting from black suppression, the country can be regarded as currently being at a critical

milestone in it's history. "The labour situation in South Africa can be regarded as being in a state of crises. .... The black labour force in South Africa is becoming highly politicized and much of what happens on the labour front is related to national politics rather than specific employment issues." [29]

2.4.2. Strikes and JIT

Figure 5 indicates that loss of man days as a result of strikes increased noticeably from 1980 onwards. A considerable drop was recorded in 1983, but large increases were manifested in 1984 and 1985. Some industrial relations specialists attribute these increases to the phenomenon that workers use industrial action to make political demands ." [30]

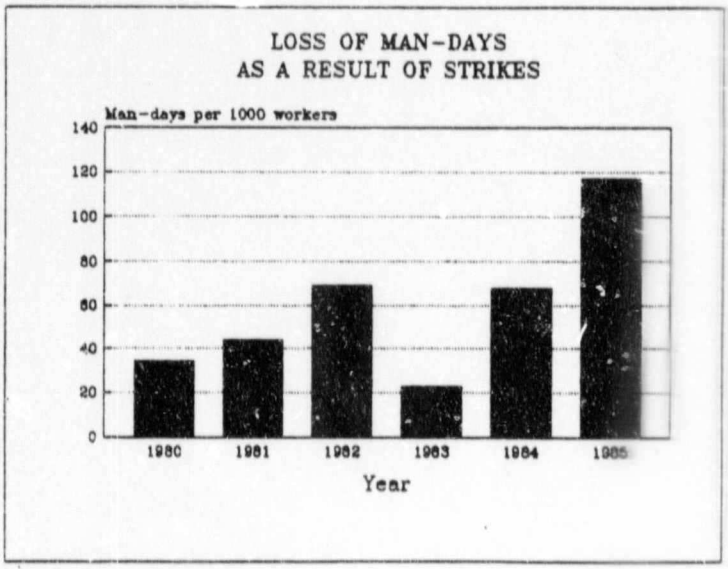


FIGURE 5: Loss of Man Days as a Result of Strikes.

The issue of labour strikes has led many manufacturers to be exceptionally cautious about implementing Just-in-Time. [31] In

the Just in Time environment of reduced inventories, and buffer stocks, a manufacturer will not be able to fill orders if production comes to a halt for lack of staff during a strike. There are two answers to this problem. The first is to implement JIT without immediately reducing finished goods inventory levels. By doing this many of the benefits of JIT may still be realized without placing the company at the risk of stockouts. [32] The disadvantage of this solution is that the full benefits of JIT may never be realized since employees will not be involved 100%. The second solution is to attack the problem at it's root i.e. in industrial relations in a bid to decrease the extent and frequency of the strikes. This is however a much wider issue in that it is directly dependent on the state of unrest of the labour force which is in turn dependent on factors such as internal company politics and wider issues such as government policies and national economics. This comment identifies the importance of attention being directed towards the sphere of industrial relations which is covered in section 2.4.4 of this report.

2.4.3 Education

Apartheid and unrest related violence has led to international trade links being severed in an ever increasing multitude of industries. International pressures have a considerable impact on economic growth. Lack of confidence in South Africa by investor countries, together with calls for disinvestment from South Africa for political and economic reasons, has led to a decline in capital investment in recent years. "The quantity of capital resources available per employee is a very important

the Just in Time environment of reduced inventories, and buffer stocks, a manufacturer will not be able to fill orders if production comes to a halt for lack of staff during a strike. There are two answers to this problem. The first is to implement JIT without immediately reducing finished goods inventory levels. By doing this many of the benefits of JIT may still be realized without placing the company at the risk of stockouts. [32] The disadvantage of this solution is that the full benefits of JIT may never be realized since employees will not be involved 100%. The second solution is to attack the problem at it's root i.e. in industrial relations in a bid to decrease the extent and frequency of the strikes. This is however a much wider issue in that it is directly dependent on the state of unrest of the labour force which is in turn dependent on factors such as internal company politics and wider issues such as government policies and national economics. This comment identifies the importance of attention being directed towards the sphere of industrial relations which is covered in section 2.4.4 of this report.

2.4.3 Education

Apartheid and unrest related violence has led to international trade links being severed in an ever increasing multitude of industries. International pressures have a considerable impact on economic growth. Lack of confidence in South Africa by investor countries, together with calls for disinvestment from South Africa for political and economic reasons, has led to a decline in capital investment in recent years. "The quantity of capital resources available per employee is a very important

factor in productivity improvement and hence in achieving higher real wages and a better standard of living. Unless there is more capital, technological improvement, organizational and structural change - or a better trained labour force - real wages cannot grow in the context of a fully employed economy because output per employee cannot grow." [33]

South Africa is dependent on international financing for it's development needs, and since this is not forthcoming little attention has been given to critical areas such as education and training, both on a macro and micro scale.

"On the brink of the knowledge intensive 1990's, the foremost characteristic of a " Winning Nation " has to be the quality of it's education system." [34] The Japanese have only 1% functional illiterates versus 13% in America. "Approximately 50% of the South African labour market is considered functionally illiterate." [35] Since education is considered a lead indicator for technological "take-off" [36] a tremendous amount of effort must be put into improving the South African Education System for both black and white. "There is a productivity growth which is derived from having better trained workers who are both more knowledgeable and skilled in doing the tasks that they are hired to perform. Every modern economy should devote a large proportion of it's resources towards educating it's population, not only because education is a worthwhile endeavor in itself but also because trained individuals are necessary for the operation of a modern economy." [37]

Since 50% of the South African labour market is considered

functionally illiterate, there will be a considerable impact on the way information must be handed down in a manufacturing organization attempting to train it's work force with respect to the JIT principles. [38] For example, Toyota's manager in charge of education described the company's philosophy on education as follows: "Toyota does not conduct any sophisticated or systematic education or training. However, Toyota obstinately conducts hands-on and very basic educational activities." [39]

2.4.4 Pluralism.

The South African industrial relations system is based on pluralistic assumptions. This approach is in turn based on the following premises :-

" 1) The organization comprises individuals and groups who have conflicting interests and goals.

2) A trade union is a legitimate and necessary means by which workers may protect and further their interests.

3) Conflict is inherent and natural in the relationship but because of the interdependence of employers and workers both parties agree that destructive conflict must be avoided.

4) Collective bargaining between employees and workers is a means of achieving compromise and rules for controlling conflict.

5) Commitment to the system is necessary for mutual survival and sticking to the rules is an essential factor if collective bargaining is to succeed.

6) The role of management is accepted as legitimate with the proviso that workers are involved in certain areas of

decision making." [40]

The concept of Just-in-Time, however, indicates that rather than have conflicting interests between management and workers, the separation of "Them and Us" should be between the JIT company and its competitors. The organization's employers and workers should have a common objective of "beating the competition". Although the primary premise of Unitarism is an organization with a unitary structure i.e. employees and workers have common objectives and values, it has other premises indicating a paternalistic work situation and the role of "boss" being paramount and legitimate. Just-in-Time cannot function effectively under these conditions either.

The industrial relations system for a Just-in-Time environment is a blend of the two sets of premises presented above, but primarily it is dependent on a participative management style rather than an autocratic management style, as well as an environment which encourages employee involvement in operating procedures of all kinds. There must be a common objective of improving the company's position in the market place. It was within this type of environment that companies such as Rowen Engineering and Toyota S.A. have successfully started JIT implementation and are running JIT to a high degree at present.

3.0. THE SOUTH AFRICAN FURNITURE INDUSTRY

3.1 Historical Note

Furniture manufacture is one of the oldest industries in South Africa. Up to the end of World War II furniture production was largely a craft. Although mechanized systems were already in use, it was only in the decades of the 1950's and 1960's that mass production became a characteristic of the industry. Nevertheless, the industry has retained its dualistic nature, combining mass production of medium and cheap grade furniture with production of handmade, craftsman's furniture in the high price group. [41]

As an employer of labour it ranks about 14th in the industrial hierarchy. [42]

"As regards timber, approximately 60% is supplied from local sources, and is used mainly for cheap grades of furniture. It is only since 1970 that some S.A. grown timber has been produced and processed into a standard suitable for use in quality furniture. This supply however, has not kept up with the demand and has led to numerous developments.

1) There has been an increase in importation of solid woods such as imbuia and oak from abroad.
2) Solid wood has been replaced, to a large extent, by cheaper veneered furniture.
3) The consumption of plastics, plywoods, chipboards, hardboards, glass and metals has increased in the production of furniture." [43]

The result has been the production of a new generation of furniture which is generally viewed as inferior in value to the solid wood furniture produced in small quantities by craftsmen prior to World War II when solid timber was abundant. [44]

3.2 Productivity Levels in the Furniture Industry

"There are 868 different furniture manufacturers in S.A. Of these only 54 are of such size that they have split the management of the business into different functional departments. These 868 establishments in the furniture industry represent 5,84% of the total manufacturing establishments in the country." [45] "In 1970 there were an estimated 650 furniture manufacturing establishments in S.A. [46] which represented 4,75% of the total manufacturing establishments.

"During 1986 the total turnover of the residential furniture industry was R759 million in current terms." [47]

"The 1984 all race employment figure for the furniture industry was 373 300. By 1986 this figure had declined to 357 100." [48] This figure represents manufacturing, wholesaling, retailing and distribution employment for all types of furniture. The furniture industry is currently performing extremely poorly in terms of productivity. The average annual growth rate of productivity between 1976 and 1985 was -0,4% as compared to a manufacturing average of +1,9% [Figure 6]. In terms of capital productivity growth rates, the furniture industry showed an annual growth rate between 1976 and 1985 of -0,8%. The manufacturing average was considerably worse at -3,4%." [49]

"Capital return on investment in furniture is the second lowest in manufacturing at -1,9%. The average ROI in manufacturing during 1985 was 8,3%." [50]

"In terms of value added per employee in 1986, the furniture industry is rated as the third lowest of all South Africa's industries." [51] VAPE was R9997. The lowest was R6770 and the highest R76414.

"Between 1985 and 1986 labour productivity improved by 2,8% in the industry. However, unit labour cost rose 20,5% over the same time period." [52]

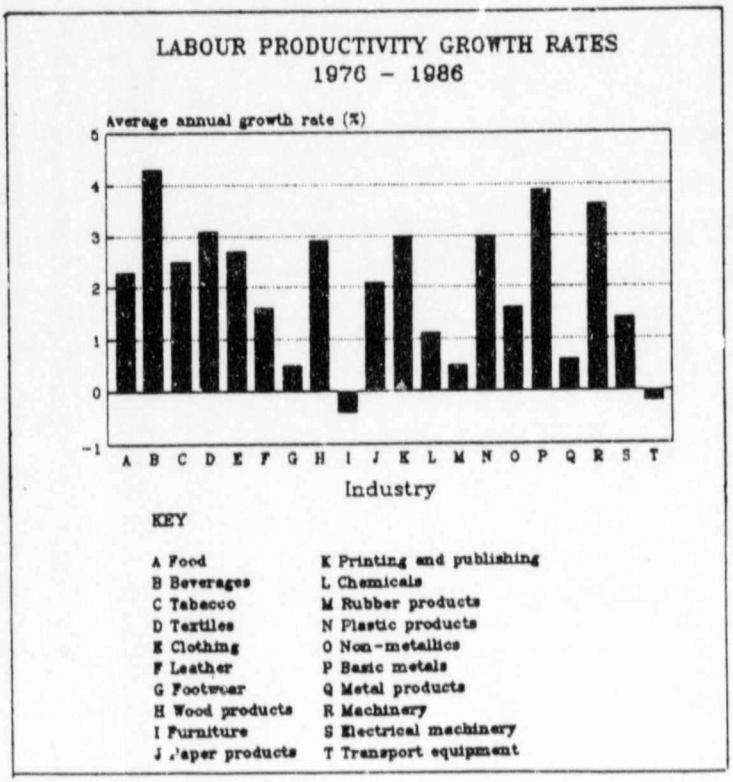


FIGURE 6: Labour productivity growth rates 1976 - 1985.

Unless some immediate action is taken in a bid to rectify this poor productivity trend, the South African furniture industry will continue to deteriorate. Just-in-Time is, in effect, a productivity improvement program, and as such it will improve the furniture industry's situation if correctly applied. The author believes that without substantial productivity improvements within the furniture industry, the industry will not be able to compete with imported goods on local markets, let alone compete on foreign markets.

3.3 Some Important Developments in the Industry

Figure 7 indicates private consumer expenditure on residential furniture as a percentage of total consumer expenditure between 1960 and 1986. Between 1960 and 1974 expenditure on furniture increased. "This general rise may be attributed to six different factors :-

- Rise in gross domestic product
- Rise in personal disposable income
- Population growth
- Rate of residential construction
- Rate of family formation
- Rate of furniture replacement." [53]

From 1974 to 1986 the furniture industry lost ground. This is explained by :-

- Substantial rate of increase in labour costs without an associated productivity gain which forced manufacturers to increase prices in order to recover losses, [54]
- This time period saw an economic depression and high inflation rate.

The small rise in Figure 7, around 1981 - 1982 coincides with a mini boom which occurred in South Africa due to a rocketing international gold price. After 1982 the downward trend resumed as did the economic depression.

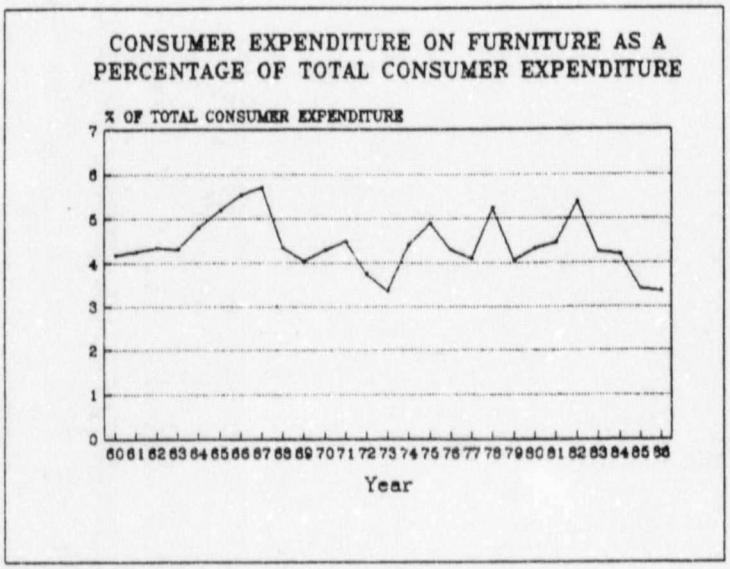


FIGURE 7: Consumer expenditure on furniture as a percentage of total consumer expenditure

The downward trend between 1975 and 1986 however, is due to more than simply an economic depression. Figure 8 indicates the actual sales in the furniture industry as a percentage of total sales in manufacturing. During this time period there was a definite downward trend in the sale of furniture in comparison to sales in other manufacturing industries. This trend is explained by the fact that consumers view South African furniture generally as poor value for money. The price of furniture after 1975 increased prohibitively as a result of severe increases in unit labour costs. [See Figure 9] "At one stage during this period an

18% increase in wages coincided with a 2% drop in productivity." [55] In addition solid woods are appearing less and less frequently, in lower quantities and lower grades. Since the demand for solid wood is greater than the supply, it is natural to expect the cost of raw materials to rise. This will be reflected in the selling price. In the quest for higher volumes many manufacturers take "short cuts" in the production methods used. This in turn, lowers both the value of the product and the quality of the product still further. In addition there is presently no SABS quality mark for furniture. According to a recent radio report there is currently some consideration being given to this quality issue with the South African Bureau of Standards now considering a SABS mark for furniture. [56]

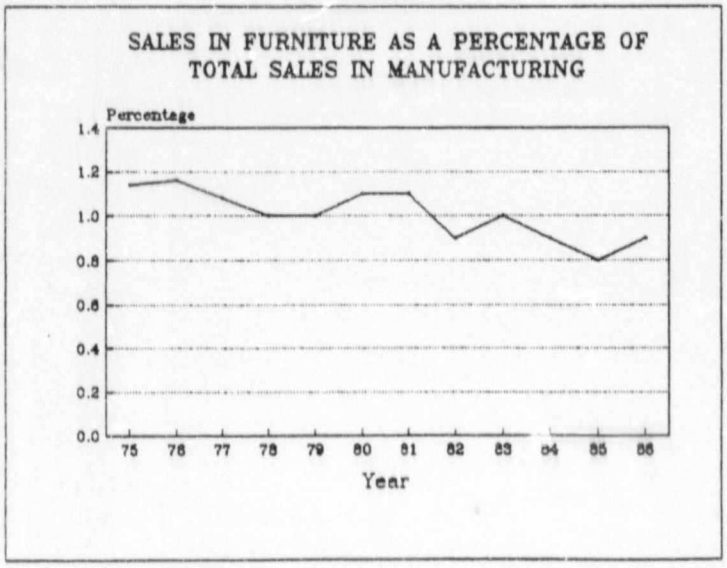


FIGURE 8: Sales in furniture as a percentage of total sales in manufacturing.

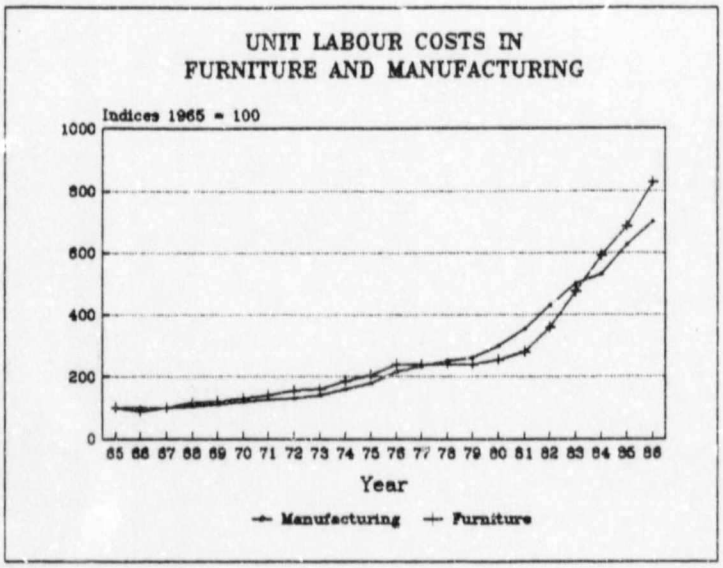


FIGURE 9: Unit labour cost in manufacturing and furniture.

F.gures 10, 11 and 12 indicate one further point of importance. Over the past 20 years there has been a substantial increase in both the number of establishments in the furniture industry and the number of employees in the industry. "This has resulted in an increase in sales from ±R200 million in 1975 to ±R759 million in 1986. If however, we account for the inflation over this period then sales increased from R319,8 million (1980 rand value) to only R383,7 million in 1986." [57]

"The furniture industry boasts an especially high percentage capacity utilization which increased from 86% in 1984 to 88% in 1986." [58] Since its productivity is in a state of crisis with a negative productivity growth rate both for labour productivity

Author Azzie Maurice Michael
Name of thesis The Implementation Of The "just-in-time" Manufacturing Philosophy Into The South African Furniture Industry. 1988

PUBLISHER:
University of the Witwatersrand, Johannesburg
©2013

LEGAL NOTICES:

Copyright Notice: All materials on the University of the Witwatersrand, Johannesburg Library website are protected by South African copyright law and may not be distributed, transmitted, displayed, or otherwise published in any format, without the prior written permission of the copyright owner.

Disclaimer and Terms of Use: Provided that you maintain all copyright and other notices contained therein, you may download material (one machine readable copy and one print copy per page) for your personal and/or educational non-commercial use only.

The University of the Witwatersrand, Johannesburg, is not responsible for any errors or omissions and excludes any and all liability for any errors in or omissions from the information on the Library website.