COPYRIGHT AND CITATION CONSIDERATIONS FOR THIS THESIS/ DISSERTATION

- Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

- NonCommercial — You may not use the material for commercial purposes.

- ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

How to cite this thesis

The suitability of mass customisation for South African clothing manufacturers

by

MARIE AOUN

Minor Dissertation

Completed in partial fulfilment of the requirements for the degree

Magister Commercii

in

Business Management

UNIVERSITY OF JOHANNESBURG

Faculty of Management

Supervisor: Dr. Peta Thomas

2016
DECLARATION

I, Marie Aoun, declare that this minor dissertation and the work presented in it are my own and have been generated by me as the result of my own original research.

I further declare that:

i. This work was done wholly or mainly while in candidature for the M.Com degree at the University of Johannesburg;

ii. Where any part of this minor dissertation has previously been submitted for a degree or any other qualification at any other institution, this has been clearly stated;

iii. Where I have consulted the published work of others, this is always clearly attributed and referenced;

iv. Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this minor dissertation is entirely my own work;

v. I have acknowledged all main sources of assistance;

vi. Where the minor dissertation is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;

vii. None of this work or its parts have been published or submitted before.

Signed : ML AOUN

Dated : 16 March 2016
ACKNOWLEDGEMENTS

Firstly, I would like to thank my husband, Angus Campbell, for his patience, guidance and support throughout this year. I would also like to thank my supervisor, Dr. Peta Thomas, for her continued enthusiasm for this study and her belief in my ability to make the right decisions along the way. I would like to thank the respondents who, so kindly and enthusiastically shared their knowledge with me. I would like to thank Prof. Dominik Walcher, who generously provided me with access to the *Customization 500* study. Finally, I would like to thank the University of Johannesburg for the scholarship that I received to study this Masters in Commerce.
ABSTRACT

Mass Customisation (MC) is increasingly being touted in the global clothing industry as a key strategy to survive an ever-more turbulent market. A European Union report (Probst, Monfardini, Frideres, Demetri, Kauffmann & Clarke, 2013) estimates that five per cent of the global fashion industry will be mass customised by 2018. This growing importance necessitates its consideration in the South African context, especially as a possible opportunity for the ailing clothing manufacturing sector. Since there is a dearth of literature on MC in the South African context, an exploration into the suitability of MC as a manufacturing strategy for South African clothing manufacturers was a first step in understanding this opportunity. The competencies needed to successfully undertake MC manufacturing were drawn from the literature and were used to frame the research. Three corporate clothing manufacturers were selected as a case for this study due to the existing levels of customisation that exist in this sector. In-depth interviews were conducted in order to determine whether these firms currently exhibited the existence of the identified competencies essential to undertake MC within their organisations. One of the interviewed manufacturers seemed to have all the competencies needed to manufacture for mass customisation, whilst another very-almost did. All three manufacturers were severely affected by the dearth of suppliers and this led to the competencies identified from the literature being revised for the South African context.

Keywords: Mass customisation; Clothing manufacturing; South Africa
# TABLE OF CONTENTS

Declaration .................................................................................................................................................. i
Acknowledgements .................................................................................................................................. ii
Abstract .................................................................................................................................................... iii
List of figures .............................................................................................................................................. viii
List of tables .............................................................................................................................................. ix
List of appendices ..................................................................................................................................... x
List of abbreviations and acronyms ........................................................................................................ xi
Glossary of key terms/concepts ............................................................................................................. xii

## CHAPTER 1: PURPOSE AND PROBLEM STATEMENT .............................................................. 1

1.1. Introduction .......................................................................................................................................... 1
1.2. Background to the study ...................................................................................................................... 1
  1.2.1. The global context ......................................................................................................................... 1
  1.2.2. The South African context .............................................................................................................. 5
1.3. Problem statement .............................................................................................................................. 6
1.4. Research aim ........................................................................................................................................ 7
1.5. Research objectives ............................................................................................................................ 7
  1.5.1. Primary objective ............................................................................................................................ 7
  1.5.2. Secondary objectives ..................................................................................................................... 7
1.6. Literature review strategy .................................................................................................................. 8
1.7. Scope of the study .............................................................................................................................. 8
1.8. Delimitations ....................................................................................................................................... 9
1.9. Overview of chapters ......................................................................................................................... 10
1.10. Summary of Chapter 1 ..................................................................................................................... 11

## CHAPTER 2: LITERATURE REVIEW ..................................................................................... 12

2.1. Introduction ....................................................................................................................................... 12
2.2. Mass customisation ............................................................................................................................ 12
2.3. MC of clothing ................................................................................................................................... 17
  2.3.1. A brief history of customisation in clothing .................................................................................. 18
2.3.2. The importance of MC in the clothing industry ................................................ 19
2.3.3. Mass customised clothing offerings ................................................................ 20
2.3.4. The mass customising clothing customer ....................................................... 21
2.3.5. Selling and marketing mass customised clothing: Configurators .................... 22
2.4. Manufacturing for MC ................................................................................... 24
2.4.1. The nature of MC manufacturing................................................................. 25
2.4.1.1. Inversion of supply chain .......................................................................... 25
2.4.1.2. Design-led push versus demand-pull ........................................................ 26
2.4.1.3. Decoupling point ....................................................................................... 27
2.4.1.4. Postponement ........................................................................................... 28
2.4.1.5. Product families ....................................................................................... 29
2.5. Competencies needed for MC manufacturing ............................................ 31
2.5.1. Competency 1: Ability to undertake flexible manufacturing ............................. 31
2.5.1.1. Presence of flexible manufacturing systems ............................................. 33
2.5.1.2. Adaptive Human Resources ..................................................................... 36
2.5.2. Competency 2: Supportive technologies ......................................................... 37
2.5.2.1. Investment in supportive technologies ...................................................... 38
2.5.2.2. Integration ................................................................................................. 39
2.5.2.3. Technological literacy ............................................................................... 40
2.5.3. Competency 3: An integrated and responsive supply chain ........................... 41
2.5.3.1. Information sharing ................................................................................... 42
2.5.3.2. Collaborative planning .............................................................................. 44
2.5.3.3. Modelling and simulation .......................................................................... 44
2.6. Summary of Chapter 2 .................................................................................. 45

3. CHAPTER 3: RESEARCH METHODOLOGY ................................................ 47
3.1. Introduction ................................................................................................... 47
3.1.1. The research questions................................................................................... 47
3.2. Research strategy ........................................................................................... 47
3.2.1. Research population .................................................................................... 49
3.2.2. Research instrument ................................................................................... 52
3.2.3. Research methodology ................................................................................ 53
4. CHAPTER 4: INTERPRETATION OF THE FINDINGS ........................................... 59
4.1. Introduction ................................................................................................... 59
4.2. Concept: Ability to undertake flexible manufacturing .................................. 59
  4.2.1. Sub-concept: Presence of flexibility .......................................................... 60
    4.2.1.1. Theme: Order quantity variances .......................................................... 60
    4.2.1.2. Theme: Level of customisation ............................................................ 61
    4.2.1.3. Theme: Simultaneous mass manufacturing ......................................... 62
    4.2.1.4. Theme: Style variances ....................................................................... 63
    4.2.1.5. Theme: Presence of lean manufacturing ............................................. 64
    4.2.1.6. Theme: Presence of agile manufacturing ............................................. 65
    4.2.1.7. Theme: Presence of quick response ................................................... 65
    4.2.1.8. Theme: Presence of Modular Production .......................................... 67
  4.2.2. Sub-concept: Adaptive and effective human resources ............................ 70
    4.2.2.1. Theme: Teamwork ............................................................................. 71
    4.2.2.2. Theme: Multi-skilled operators and management ............................... 71
    4.2.2.3. Theme: Training ............................................................................... 72
    4.2.2.4. Theme: Productivity ......................................................................... 73
4.3. Concept: Supportive technologies ............................................................... 77
  4.3.1. Sub-concept: Presence of aiding technologies ......................................... 78
    4.3.1.1. Theme: Manufacturing technologies .................................................. 78
    4.3.1.2. Theme: CAD .................................................................................... 79
    4.3.1.3. Theme: ERP .................................................................................... 80
    4.3.1.4. Theme: Appropriateness ................................................................... 81
  4.3.2. Sub-concept: Integration ......................................................................... 81
  4.3.3. Sub-concept: Technological literacy ......................................................... 82
4.4. Concept: Stable supply base ....................................................................... 84
  4.4.1. Sub-concept: Stable supply ..................................................................... 85
LIST OF FIGURES

Figure 2.1: Market development from local to mass-customised........................................13
Figure 2.2: Stages of MC ........................................................................................................15
Figure 2.3: MC research 2001-2010 .................................................................................16
Figure 2.4: Indochino online shirts configurator, prompts 1 to 4 ......................................23
Figure 2.5: Push and pull of mass manufacturing versus MC ............................................27
Figure 2.6: Product families in a men’s dress shirt .............................................................30
Figure 2.7: Conceptual framework of the identified competencies needed in order to successfully implement MC ..............................................................45
Figure 3.1: Conceptual framework with question numbers pertaining to each sensitising concept .................................................................................................54
Figure 4.1: The ability to undertake flexible manufacturing as a concept with the themes and sub-concept that emerged to support it ..............................................77
Figure 4.2: Supportive technologies as a concept with the themes and sub-concepts that emerged to support it ...............................................................84
Figure 4.3: Stable supply base as a concept based with the themes and sub-concepts that emerged to support it ...............................................................92
Figure 4.4: Summary of the themes, sub-concepts and concepts identified in the findings in relation to the sensitising concepts identified in the literature ............................................99
Figure 5.1: Conceptual framework of the competencies needed for the successful implementation of MC, according to the literature ....................................102
Figure 5.2: Conceptual framework of the competencies needed for the successful implementation of MC, according to the findings........................................104
LIST OF TABLES

Table 3.1: Respondents’ profiles ..............................................................51
LIST OF APPENDICES

Appendix 1: Interview guide ................................................................. 121
Appendix 2: Interview transcripts (removed from final copy) .......... 123
Appendix 3: Conceptual framework with interview question numbers ........................................ 124
Appendix 4: Sample of the coding table ............................................. 125
Appendix 5: Blank informed consent agreement ................................ 128
Appendix 5: Conceptual framework with emerged themes ............... 129
LIST OF ABBREVIATIONS AND ACRONYMS

CAD: Computer Aided Design
EDI: Electronic Data Interchange
ERP: Enterprise Resource Planning
EU: European Union
GSD: General Sewing Data
ICT: Information and Communications Technology
IT: Information Technology
MC: Mass Customisation
MHS: Material Handling System
SETA: Sector Education and Training Authority
SME: Small-to-Medium Enterprise
GLOSSARY OF KEY TERMS/CONCEPTS

Clothing: “A term referring to a covering that is worn to cover the body or to keep warm” (Gersak, 2013:1). Used synonymously with “apparel” and “garment”.

Clothing industry: “The clothing industry is made up of the clothing manufacturers and contractors, wet processors, wholesale representatives and direct importers, and retailers” (Brown & Rice, 1997:2).

Clothing manufacturing: “Clothing manufacturers are chiefly responsible for the manufacturing of clothing. However, their responsibilities may also include the design of the garment, the purchasing of the fabric and the findings, and the sale of the clothing to a retailer” (Brown & Rice, 1997:2-3). Used synonymously with “clothing producers”.

Configurators: “Known as configurators, choice boards, design systems, toolkits, or co-design platforms, these systems are responsible for guiding the user through the configuration process. Different variations are represented, visualized, assessed and priced which starts a learning-by-doing process for the user. While the term “configurator” or “configuration system” is quoted rather often in literature, it is used for the most part in a technical sense addressing a software tool.” (Franke & Piller, 2003:4).

Custom-made: “Adjective describing garments made by tailor or couture house for an individual customer. The correct size is achieved either by fitting on a dress form adjusted to the customer’s measurements or by several personal fittings.” (Mankey Calasibetta & Tortora, 2003:120)

Decoupling point: “The decoupling point is also the point at which strategic stock is often held as a buffer between fluctuating customer orders and/or product variety and smooth production output” (Naylor, Naim & Berry, 1999:108).

ERP: “An Enterprise Resource Planning (ERP) system is a suite of integrated software applications used to manage transactions through company-wide business processes, by using a common database, standard procedures and data sharing between and within functional areas” (Moutzis & Doukas, 2014:10).
Fabric: “Cloth made of textile yarns by weaving, knitting, lace making, braiding, netting, or felting” (Mankey Calasibetta & Tortora, 2003:449)

Fashion industry: “Design, produce, distribute and sell fashionable goods both domestically and internationally” (Mankey Calasibetta & Tortora, 2003:154). Includes, but is not limited to, clothing.

Fashion: “A sociocultural phenomenon in which a preference is shared by a large number of people for a particular style that lasts for a relatively short time, and then is replaced by another style...is particularly pronounced and rapid in apparel [clothing]” (Mankey Calasibetta & Tortora, 2003:154).

Lead-time: “How fast an order is fulfilled - how long it takes for the factory to dispatch the ordered products calculated from the moment the order was input to the system” (Rajaniemi, 2012).

Mass customisation: The development of “products and services that best meet individual customers’ needs with near mass production efficiencies” (Tseng & Jiao, 1996:153).

Mass manufacturing: “Manufacture in large quantities of the same item of apparel by workers using machines for production” (Mankey Calasibetta & Tortora, 2003:324). Used synonymously with “mass production”.

Ready-to-wear: “Apparel that is mass-manufactured in standard sizes” (Mankey Calasibetta & Tortora, 2003:386).

Supply chain: “A supply chain is a system whose constituent parts include material suppliers, production facilities, distribution services and customers linked together via a feedforward of materials and feedback of information” (Stevens, 1989:3).

Tailor-made: “Garment made specifically for one individual by a tailor – customer’s measurements are taken and several fittings are necessary” (Mankey Calasibetta & Tortora, 2003:447).

Trend forecasting: “Trend generally means a direction, movement or flow, etc., but in fashion term, trend is a general tendency of the next fashion. Trend, which is influenced by diverse factors such as social, political, economical and cultural changes, also includes movement of the consumers’ point of view or emotion.” (Cho & Lee, 2005:18)
CHAPTER 1
PURPOSE AND PROBLEM STATEMENT

1.1. Introduction

Chapter 1 is the introduction to this study. In order to validate the interest in this study, background information on the topic is first provided. Following this, the research problem, aim and objectives are stated. A strategy for the literature review, Chapter 2, is then provided. Finally, the scope and delimitations of the study are set out.

1.2. Background to the study

The background to the study is discussed. A global perspective is initially provided, followed by the South African context.

1.2.1. The global context

According to McKinsey (Keller, Magnus, Hedrich, Nava & Tochtermann, 2014:1), few industries require companies to stay as nimble and on their toes as the global fashion industry. Change is inherent in the fashion industry, both because of the trend-driven nature of fashion consumption as well as its seasonality (Keller et al., 2014:1). There is, however, a different kind of change afoot in the industry at the moment – a seismic shift of sorts. Top trend forecaster Lidewij Edelkoort has gone so far as to say that fashion is dead (Dezeen, 2015). Edelkoort, who runs multiple trend forecasting agencies and who advises companies such as Gap, Estee Lauder and Coca Cola on ways to stay ahead of their customers (Rohwedder, 2009), cites problems within the industry itself, such as the unsustainable nature of fast fashion
and the loss of authenticity in design (Dezeen, 2015). Edelkoort also believes that the fashion industry has lost sight of its consumer base (Dezeen, 2015). Edelkoort states:

“The consumers of today and tomorrow are going to choose for themselves, creating and designing their own wardrobes. They will share clothes amongst each other since ownership doesn’t mean a thing anymore. They will rent clothes, lend clothes, transform clothes and find clothes on the streets”.
(Edelkoort cited in Dezeen, 2015).

While Edelkoort may be extreme in her views, she echoes what many others have foreseen. As early as 1970 Alvin Toffler in his bestselling book titled *Future Shock* (1970:264) foresaw society moving towards the greatest ever variety of unstandardised goods. Stan Davis (1989:20) named this phenomenon *mass customisation* in 1987 and predicted that the ultimate logic of differentiation is the ‘market of one’: the individual consumer. There is nothing especially new about targeting the individual consumer for the fashion industry, as it was a customised one all the way up until the early twentieth century when mass produced ready-to-wear clothing was first adopted on a large scale (Business of Fashion, 2011). In fact, pockets of customised clothing production continued to exist, most notably in the form of tailor-made clothing, but, without the mass production cost efficiencies, these are both more time-consuming and more expensive than ready-to-wear equivalents (Marketti & Parsons, 2007:80). While customisation may not be new to fashion, what is new is the notion that the individual customer might once again be targeted but, this time, in an efficient and profitable way.

The mass production of custom-made goods may seem an anachronous concept since for a long time these two have been perceived to be antithetical. Mass Customisation (MC), as it is known, marries these polar opposites together on the back of important advances in technology. These technological advances,
particularly in Information and Communications Technology (ICT) (further discussed in Chapter 2) have enabled the application of mass manufacturing efficiencies to be applied to the traditional world of custom-made clothing. Tseng and Jiao (1996:153) define MC as the development of “products and services that best meet individual customers’ needs with near mass production efficiencies”. The implication of this marriage is that customised goods can now be produced at near-mass-production prices, making these products accessible to the mass market (Tseng & Hu, 2014:838).

MC is increasingly being touted in the global clothing industry as a key strategy to survive an ever-more turbulent market (Pan & Holland, 2006: 347). Market turbulence is characterised by high levels of instability, uncertainty and a lack of control in an organisation’s market (Pine, 1993b:7). An organisation that cannot rely on stable demand or that cannot continue to control the market is no longer in a position to rely on mass manufacturing’s efficiencies of scale (Pine, 1993:7). Demand forecasting in the clothing industry is especially complex, as a great deal of demand uncertainty exists due to the combined lack of historical data and the presence of seasonally changing fashion trends (Nenni, Giustiniano & Pirolo, 2013:1). Add to these the brevity of the selling period and the long replenishment times on account of off-shore production and it is clear why inaccurate forecasts are rife in the clothing industry (Nenni, Giustiniano & Pirolo, 2013:1). Forecasting errors lead to any of the following: stock-outs, high levels of inventory, obsolescence, inefficient resource utilisation, and the need to discount goods in order to sell them (Nenni, Giustiniano & Pirolo, 2013:1).
Forecasting errors are only further exacerbated by the increasing heterogeneity of the market. As consumers become increasingly focussed on their own needs and expectations, they are less likely to accept current mass-market offerings (Bellemare, Carriere and Baptiste, 2014:95). Tian, Bearden and Hunter (2001:50) proved that “consumers acquire and display material possessions for the purpose of feeling differentiated from other people”. In addition, Bellemare et al. (2014:95) claim the need for uniqueness is especially prevalent in clothing purchasing decisions.

The concept of MC in fashion has already been made a reality: a European Union (EU) report on the clothing MC sector reports that one third of Nike shoes sold online are now customised (Probst, Monfardini, Frideres, Demetri, Kauffmann & Clarke, 2013:8). Even the luxury fashion sector, historically protective over the design of its final product (Business of Fashion, 2015), has joined the fray. Luxury fashion retailer, Burberry (Burberry, 2015), allows customers to choose scarves in colours, fabric weights and patterns of their choosing, together with the option of monogramming their initials at checkout (Abnett, 2015). Although both Nike and Burberry are sizeable enterprises, research has found that Small and Medium Enterprises (SMEs) are the ones who stand to benefit most from a customisation business model (Taps, Brunoe, Nielsen & Joergensen, 2014:349; Jitpaiboon, 2012:140). Fashion businesses engaging in MC are early participants in what is estimated to be a 22.7 billion Euro industry by 2018 (Probst et al., 2013:2). This figure would correspond to five per cent of the worth of the global fashion industry at that point.
1.2.2. The South African context

The potential of MC is therefore too important for the South African fashion industry to ignore it. The South African clothing manufacturing industry is particularly in need of alternative strategies. Domestic clothing production is approximately 60% of domestic demand (Morris & Barnes, 2014:11). Nattrass & Seekings (2012:2) attribute this decline to lowered trade barriers, the relative cheapness of offshore labour and a lack of investment in the local clothing-manufacturing sector (Nattrass & Seekings, 2012:2). The result is that the South African clothing manufacturing industry has shed 120,000 jobs since 1980 (Nattrass & Seekings, 2012:2). The possible closure of both Edcon (Moorad & Thomas, 2015) and the Platinum Group (Moorad, 2015) will continue to negatively affect this sector. Since clothing manufacturers mostly employ unskilled workers, the newly unemployed cannot readily be absorbed into other job streams (Morris & Barnes, 2014:2).

MC is particularly helpful as a strategy for manufacturing sectors that have been affected by the shift of production to low-cost locations, as South Africa has. According to Senayake and Little (2010:282), MC will continue to offer a competitive advantage over the trend to migrate manufacturing to less-developed nations. This is corroborated by Pine (Abnett, 2015) who states that factories must be created close to the customer. Yang, Zang and Shan (2007:168) cite technological developments and the advantage of being in close proximity to the target market as key advantages that domestically manufactured mass customised products have over those that are manufactured off-shore. Top mass customising companies Zazzle and Café Press, both manufacture the vast majority of the products domestically in the United States (Flynn & Flynn Vencat, 2012:38-39).
Although the future of MC in fashion is imminent, pertinent and potentially lucrative, it is not easily achieved. In the most extensive study on MC businesses to date, Walcher and Piller (2012:288) found that almost 17% of the 500 MC businesses that they surveyed went out of business in the first twelve months of their existence. Shifting to MC requires a radical rethink of existing business processes (Yi, Ngai & Moon, 2011:271-2). Bringing the customer to the early stages of product development, as MC does, requires an inversion of traditional mass manufacturing supply chains (Sommer, 2014:63). Pan and Holland (2006:348), Skjelstad and Thomassen (2014:40) and Probst et al. (2013:3) all agree that structural changes to the supply chain are the biggest implication of implementing MC. As such, production planning and manufacturing becomes the most challenging aspect of implementing MC (Tseng & Hu, 2014:840).

1.3. Problem statement

The suitability of MC for South African clothing manufacturers needs to be better understood if it is to be a viable option for future clothing consumption, and therefore clothing manufacturing. There is currently no known definitive source of information on the competencies that clothing manufacturers should have prior to engaging in MC and therefore the competencies needed to engage in MC manufacturing have not, as far as the author is aware, been studied in terms of their suitability for South African clothing manufacturers.
1.4. Research aim

The aim of the research is to explore the suitability of MC as a manufacturing strategy for South African clothing manufacturers.

1.5. Research objectives

Achieving the following primary research objective focuses the research strategy that is adopted:

1.5.1. Primary objective

To explore whether South African clothing manufacturers are currently suited to MC clothing manufacturing, based on the main identified competencies needed to engage in such manufacturing.

1.5.2. Secondary objectives:

The primary objective was achieved by setting the following secondary objectives:

- Secondary objective 1: To identify the main competencies needed for the implementation of MC clothing manufacturing in South Africa, by first identifying these from relevant authoritative sources and then updating these from the findings;
- Secondary objective 2: To determine whether three South African clothing manufacturers currently have the competencies needed for MC;
- Secondary objective 3: In instances where the competencies are not present, understanding why this is the case.
1.6. Literature review strategy

Part of the first objective of this study is to identify the competencies needed for implementing clothing MC manufacturing from the literature. This objective directed the focus of the literature review. A wide scan of the known research on MC was first undertaken. Since this scan was very theoretical and a more practical approach was needed to facilitate understanding, literature dealing with the process of MC in the context of the clothing industry was then reviewed. As the focus of this study is on the manufacture of mass customised goods, a review of literature on this topic followed. Finally, the competencies that organisations require in order to manufacture for MC were identified.

Congruence in the literature was sought in order to identify what the most pertinent competencies needed for the manufacturing of clothing MC were. Furthermore, the relative importance of authors, as determined by the frequency with which they are cited, also added weight to certain authors’ perspectives on the pertinence of the identified competencies for clothing MC manufacturing. Consistent with the exploratory nature of the study, this process was inductive.

1.7. Scope of the study

The study resides in the field of business management. It is concerned with a clothing manufacturing strategy and is, therefore, pertinent to both the disciplines of fashion management and production management. More specifically, the study pertains to the subject of MC. The study is contextualised in the South African clothing manufacturing industry. Specifically, this study targets clothing manufacturers in South Africa who are considering implementing MC.
1.8. Delimitations

According to Babbie and Mouton (2011:79), exploration is a typical approach when an interest or the subject of a study itself is relatively new. This study’s aim is exploratory, as the subject of MC in South Africa is a relatively new topic. The last known study on MC in South Africa was published fifteen years ago by Radder and Louw (2000:295). Radder and Louw (2000:295) broadly explored MC as a manufacturing strategy for a number of different types of manufacturers, none of whom were specifically referred to as being clothing manufacturers. Technology, clothing consumerism, clothing manufacturing, as well as the subject of mass manufacturing itself, have all developed notably in the last fifteen years, leading to this research being out of date. Due to the exploratory aim of the study, it is geared towards gaining an overall insight and comprehension of MC and its suitability for South African clothing manufacturers, rather than accurate and detailed data (Mouton & Babbie, 2011:80).

Due to the limited scope of a minor dissertation and the fact that the study resides in the discipline of Business Management, rather than Marketing, this study does not enquire nor seek to answer whether the South African consumer is in fact ready for MC. For the same reasons, it is neither concerned with the product offering nor with the ways in which the consumer is reached and communicated with. The study therefore focuses only on the manufacturing and not the retailing of mass customised clothing in South Africa. Another practical reason for separating the manufacturing out from the retailing is that there are numerous instances in existing clothing MC where a MC clothing retailer outsources its manufacturing. Although the company
culture and the quality of the leadership present in the manufacturers will affect the implementation of a MC strategy, this would also be true of the implementation of any strategy. For this reason, company culture, leadership and management ability were not considered as competencies needed for the implementation of MC in manufacturing. Lastly, due to the limited scope of a minor dissertation and the exploratory nature of the study, it does not seek to answer questions on the financial feasibility of implementing a clothing MC manufacturing strategy for existing South African clothing manufacturers.

1.9. Overview of chapters

The following section describes the structure and content of the chapters.

Chapter 2 - Literature review

Chapter 2 is a review of existing literature pertaining to MC. Seminal MC texts are used to explain the origins of MC as a research subject and to provide key definitions. Current journal articles and important studies on MC are used to identify the competencies needed for the implementation of MC, as per part of Objective 1 of this study.

Chapter 3 – Research methodology

The focus of Chapter 3 is to state the research questions and the methodology that this study makes use of in order to answer each of these questions. A discussion of the research methodology encompasses population sampling methods, primary collection methods and the data analysis technique.
Chapter 4 – Findings and discussion

Chapter 4 is a full interpretation of the findings obtained from the study and discussion of these findings. The findings are discussed in relation to Chapter 2 so that they might be considered against the body of existing research and theory in this field.

Chapter 5 – Conclusions and recommendations

This chapter focuses on the degree to which the research objectives have been met by answering the research questions, and provides study conclusions and recommendations for further research based on these conclusions.

1.10. Summary of Chapter 1

This chapter has attempted to define the research problem. First discussing the growing importance of MC in the global clothing industry and then providing reasons for its relevance to South African clothing manufacturers. The problem of not knowing whether South African clothing manufacturers are suited to MC was then stated. The objective was therefore to first identify the competencies needed for the implementation of MC in clothing manufacturing and then to determine whether South African clothing manufacturers have these identified competencies. Chapter 2, which follows, is a review of literature pertaining to the manufacture of clothing for MC.
CHAPTER 2
LITERATURE REVIEW

2.1. Introduction

Chapter 2 is a review of the literature. The concept of MC is first explored on a theoretical level. In order to facilitate a more practical understanding of MC, it is then explored in the context of the global clothing industry. As the study’s focus is on the manufacture of mass customised clothing, literature pertinent to MC manufacturing is then reviewed. Finally, there is a review of literature that outlines the competencies needed by MC manufacturing.

2.2. Mass customisation

MC came to the fore in the early 1990s as a method for achieving a customer-driven demand and supply chain (Lyons, Coronado Mondragon, Piller & Poler, 2012:72; Walczak, 2014:220). Stanley Davis first coined the concept in a 1987 book titled *Future Perfect* (1987:1). Davis (1989:18) was inspired by the potential of the early MC efforts undertaken by Japanese construction companies. Davis (1989:16) believed that MC was the inevitable marriage of increasing market heterogeneity and advances in technology that would permit the mass manufacture of heterogeneous products. He explains how with MC “the same large number of customers can be reached as in mass markets of the industrial economy, and simultaneously treated individually as in the customized markets of pre-industrial economies” (1987:169).

Figure 2.1 is taken directly from a later article of Davis (1989:20) where he further elaborated on the concept of MC. The figure illustrates industrial market development
from local to undifferentiated mass markets, followed by increasing levels of
differentiation (Davis, 1989:20). Although niche markets are already severely
differentiated with only a few companies serving each niche, Davis (1989:20)
maintained that the ultimate outcome of differentiation is the individual customer.
Rather than return to pre-industrial custom markets, however, the individual customer
is now reached in the same manner as the mass market (Davis, 1989:20).

![Market Development Diagram]

**Figure 2.1: Market development from local to mass-customised (Davis, 1989:20)**

In a MC paradigm each customer is a separate market (Holbrook & Hulbert,
2002:716). MC therefore aims to profit from the fact that most customers are different
(Walcher & Piller, 2012:4), making market heterogeneity is a core premise of MC.
Stated differently: exact customer needs are sacrificed by the homogenous offerings
of the mass market (Weiss & Schweiggert, 2013:40). The greater the sacrifice gap,
the more important a customised offering becomes (Bardacki & Whitelock,
2003:467). The key feature of MC is therefore the ability to integrate these
heterogeneous needs with the efficiency of mass production so that similar cost
advantages are achieved to those of mass production (Tseng & Hu, 2014:838).

Another core premise of MC is that the customer is involved in the design or
configuration of the product (Holbrook & Hulbert, 2002:716). Switching to a mass
customised offering puts the power of designing or configuring the product, to a
greater or lesser extent, back in the customer’s hands, making MC a demand-driven
trend (Weiss & Schweiggert, 2013:40). This phenomenon led Addis and Holbrook
(2001:50) to write a seminal journal article on the conceptual link between MC and
experiential consumption. Addis and Holbrook (2001:51) believed that MC heralded
an “explosion of subjectivity” in the consumption of products and services. Servicing
the customer’s needs and desires to this extent requires an enterprise to become
completely customer-centric (Tseng & Piller, 2003). According to Salvador, de Holan
and Piller (2009:71) the key to understanding MC is to view it as a process for
aligning the enterprise with its customers’ needs.

Another important tenet on which the advent of MC rested and continues to rest is
enabling technologies. Davis (1989:17) stated that the increasing speed and
specificity of technologies were the foundation for MC, as these made MC financially
feasible. The exponential rate of technological advancements since Davis’s article
has continued to make MC ever more attainable. In fact, MC only became a tangible
business trend in the second half of the 2000s (Probst et al., 2013:3).

Recent developments in information and communication technology (ICT) have
enabled direct interaction between customers and enterprises (Piller, 2010:2).
Developments in manufacturing technologies, such as laser cutters, 3-D printers and
digital patterning software, have facilitated a production process that is capable of
supporting MC (Anderson-Connel, Ulrich & Brannon, 2002:242). The development of
online configurators has enabled customers to digitally configure the customisations
that they desire on products, hugely facilitating the process (Anderson-Connel, Ulrich
& Brannon, 2002:242). Configurators act as the bridge between consumers and
manufacturers and are considered to be the most important tool to finally popularise MC (Bellemare et al., 2014:96).

While Davis (1989) laid down the “vision” of MC, Joseph Pine (1993a; 1993b) developed more “practical” ways in which MC might be implemented (Fogliatto, da Silveira & Borenstein, 2012:16). For this reason, Pine is often credited as the pioneer of the practice of MC (Pan & Holland, 2006: 347). Pine (1993a:7-8) defines MC as “providing tremendous variety and individual customization, at prices comparable to standard goods and services”. In order to better explain the practice of MC, Pine (1993b:9) developed a successive five-step process to implement customisation in organisations. Figure 2.2, taken directly from Pine’s journal article titled Mass Customizing Products and Services (1993b:9), illustrates this process.

![Figure 2.2: Stages of MC (Pine, 1993:9)](image)

Pine (1993:7) proposed MC as a solution to increased market turbulence and uncertainty. The vertical axis of Figure 2.2 (Pine, 1993:9) illustrates this relationship between market turbulence and the need for MC: as turbulence increases, so too
does the need for MC. Pine’s work on MC has been very important in directing research into the practice of MC, which concerns this minor dissertation.

MC has continued to gain significant interest, both from industrial practitioners and academia alike (Jiao, Ma & Tseng, 2003:810). In 2007, 1,124 articles on MC had been published in 365 journals (Kumar, 2007:625). Fogliatto, da Silviera and Borenstein (2012:15) undertook a literature review of 178 published journal articles on MC in the decade from 2001 to 2010. They identified four main areas of interest: economics, enablers, customer-manufacturer interactions of MC and success factors (Fogliatto et al., 2012:16). Within enablers of MC Fogliatto et al. (2012:17) distinguish between research that covers methodologies used to enable MC and research on processes that enable MC. These processes are broken up into order elicitation, design, manufacture and, finally, supply chain coordination (Fogliatto et al., 2012:17-19). Figure 2.3 is an interpretation of the categories and sub-categories of research that were identified by Fogliatto et al. (2012:15-19).

![Diagram of MC research categories](image)

**Figure 2.3: MC research 2001-2010 (adapted from Fogliatto, da Silviera & Borenstein, 2012:15)**
Point three, the manufacture of mass customised goods, is highlighted in Figure 2.3, since it is the step in the process of MC that this minor dissertation is focussed on. Fogliatto et al. (2012:19) further sub-categorise the literature on MC manufacture into planning and control of manufacturing processes, and manufacturing technologies (both are also highlighted in Figure 2.3). Since this minor dissertation is concerned with identifying the competencies needed for implementing clothing MC manufacturing, literature identified by Fogliatto et al. on the success factors will also be reviewed, but only with respect to manufacture (hence the bolding and linking of “success factors” to manufacture in Figure 2.3.). It is necessary, however, that MC is broadly understood in its entirety before drilling down to the manufacture of mass customised goods. Section 2.3 aims to create a better understanding of MC by discussing it within the context of the clothing industry.

2.3. MC of clothing

According to a report on advanced manufacturing commissioned by the European Union (Probst et al., 2013:2), MC has become particularly important within the fashion sector, driven by an increased demand for clothes, handbags and shoes. The same report (Probst et al., 2013:2) estimates that the mass customised clothing industry will be worth 27.2 billion Euros by 2020, which corresponds to 5% of the global clothing industry. According to a recent survey of the North American clothing industry by the FedEx Corporation, more than 90% of respondents believed that MC would play a significant role in the following five years (Piller, 2010:282). Viewed differently, Mahmood and Kess (2015:488) believe that the fashion industry is the perfect contender for MC, thanks to its short product lifecycles, high levels of product variety, long and inflexible supply processes and unpredictable demand. Bellemare
et al. (2014:94) agree that the current situation in fashion will end up forcing manufacturers to revise their manufacturing strategies and adopt MC. Certainly, mass customised clothing is already a worthy competitor to fast fashion and mass produced clothing in the fashion marketplace (Senayake & Little, 2010:282).

2.3.1. A brief history of customisation in clothing

To a large extent, all clothing was customised for the wearer prior to the advent of the sewing machine in the middle of the nineteenth century (De Raeve, Cools, De Smedt & Bossaer, 2012:1,2). Clothing was hand-sewn either by women in households or by seamstresses (Abbott, 1981:213-223). While the overall silhouettes and the styles of the garments may have been inspired by existing examples, clothing was custom-fitted to the wearer and details such as the textile and styling were still determined by the customers’ needs, desires and budgets (Business of Fashion, 2011). The industrial revolution initially enabled the weaving and knitting of textiles en masse and, finally, the manufacture of clothing on a mass scale. Invariably, the mass manufacture of clothing required a standardisation of both sizes and styles. The working classes easily forwent this customisation, as it freed up their time, together with a substantial reduction in costs (Abbott, 1981: 213-223).

Mass manufactured clothing gradually became more acceptable throughout the twentieth century until mass production all but eclipsed craft production (Business of Fashion, 2011). Mass manufactured clothing prices have continuously been driven down due to improvements in technology and offshore production in low-wage countries in the last few decades (De Raeve, Cools, De Smedt & Bossaer, 2012:2). The result is a widening gap between mass-manufactured “ready-to-wear” clothing
and an ever diminishing customised clothing sector (Business of Fashion, 2011). The latter mostly resides in the luxurious realms of haute couture and bespoke tailoring (Business of Fashion, 2011).

In the last five years a third way has been popularised: MC offers the opportunity for customers who are not necessarily able to afford the luxurious route of visiting haute couture and tailoring houses to access the same individuality in their clothing (Business of Fashion, 2011). By restoring the custom-made into the design process, mass manufacturing blends pre-industrialisation levels of customisation with post-industrialisation manufacturing abilities and their resultant cost savings. Customers are provided with what they want and when they want it, providing a middle road between customisation and mass manufacturing (Piller et al., 2012:1).

2.3.2. The importance of MC in the clothing industry

MC is increasingly being touted in the global clothing industry as a key strategy to survive an ever-more turbulent market (Pan & Holland, 2006: 347) (Kincade, Regan & Gibson, 2007). Market turbulence is defined by high levels of instability, uncertainty and a lack of control in an organisation’s market (Piller, 1993:7). An organisation that cannot rely on stable demand or that cannot continue to control the market is no longer in a position to rely on mass manufacturing’s efficiencies of scale (Pine, 1993:7). According to Chaudry and Hodge (2012:77) companies that wish to remain competitive will need to learn to match supply and demand in order to reduce obsolescence and opportunity cost.
Demand forecasting in the clothing industry is especially complex, as a great deal of demand uncertainty exists due to the combined lack of historical data and the presence of seasonally changing fashion trends (Nenni, Giustiniano, & Pirolo, 2013:1). According to Yi, Ngai and Moon (2011:271), ranges in the clothing industry are constantly being renewed. Add to these the brevity of the selling period and the long replenishment times on account of off-shore production and it is clear why inaccurate forecasts are rife in the clothing industry (Nenni et al., 2013:1). Forecasting errors lead to any of the following: stock-outs; high levels of inventory; obsolescence; inefficient resource utilisation; and the need to discount goods in order to sell them (Nenni et al., 2013:1).

2.3.3. Mass customised clothing offerings

In the most exhaustive study of the MC industry to date, Walcher and Piller (2012:7) surveyed 500 MC enterprises in order to provide a comprehensive picture of the industry and to determine MC enterprises’ abilities to effectively interact with consumers. The two categories that dominate MC offerings are personalised media (19.2% of offerings), such as customisable books, calendars and wallpaper; and personalised fashion (15.6% of offerings), such as customisable T-shirts (Piller & Walcher, 2012:7). Fifth on the list, representing 9.6% of MC offerings, is made-to-measure clothing, such as bespoke suits and shirts (Piller & Walcher, 2012:7). Combining T-shirts and made-to-measure clothing, clothing accounts for a quarter of online MC sales.

The MC of T-shirts and made-to-measure clothing both represent different customisation points along a continuum. The extent of customisation depends on the
needs of the customer (Senayake & Little, 2010:297). Post-assembly customisation, such as choosing a customised print to be placed on an assembled T-shirt, does not represent extensive customisation (Senayake & Little, 2010:297). Made-to-measure-apparel is a form of fit and design customisation, which requires more extensive customisation and input from the customer (Senayake & Little, 2010:297). MC offerings are also tailored to serve different functions. The traditional starting point for customisation is to fit a product according to measurements provided by a customer (Piller, 2010:9). While the concept of fit makes a very strong case for MC, implementing it as a business strategy is a very complex and demanding process (Piller, 2010:9).

2.3.4. The mass customising clothing customer

From the consumer’s perspective, the MC of clothing serves a range of needs. According to a study undertaken by Fiore, Lee and Kunz (2004:845), the willingness of clothing consumers to co-design is principally driven by a desire for the experience of designing their own products. The secondary motivation for engaging in the design of products on MC websites was the desire to create a unique product (Fiore et al., 2004:845). As consumers become increasingly focussed on their own needs and expectations, they are less likely to accept current mass-market offerings (Bellemare et al., 2014:95). According to Bellemare et al. (2014:95), the need for uniqueness is especially prevalent in clothing purchasing decisions. However, customised clothing also serves a functional need in terms of fit. If one considers that mass manufactured clothing only fits 30-40% of the targeted consumers, the ability of MC to answer this need is clear (De Raeve et al., 2012:1). This MC manufacture of actual clothing is the focus of this minor dissertation as opposed to the rather limited level of customised
aesthetics found in T-Shirt printing, which is an auxiliary function to the production of the clothing itself.

2.3.5. Selling and marketing mass customised clothing: Configurators

MC requires the customer’s involvement in the creation of the final product. Online clothing MC requires the customer to create the final product through their selection of desired options (Lee & Moon, 2015:115). The interaction between the consumer and the clothing retailer and/or manufacturer consists of three principal components (Peterson, Larsson, Mujanovic, & Mattila, 2013:7). Firstly, the core configuration software guides the consumer through the process of designing the product by using prompts or questions (Peterson et al., 2013:7). Figure 2.4 is a screenshot of the four main prompts used by the MC suits retailer Indochino in its online product configurator (Indochino, 2015). The second component is a simulation of the configuration that enables the consumer to visualise the product as it is being designed and the final component is the analytical tool that translates orders into lists of materials and information required for the manufacture of each item (Peterson et al., 2013:7).
Figure 2.4: Indochino online shirts configurator, prompts 1 to 4 (Indochino, 2015)
2.4. Manufacturing for MC

According to Salvador, De Holan, and Piller (2009:77) MC “is a mechanism that is applicable to most businesses, provided that it is appropriately understood and deployed”. In order to realise MC, businesses must be able to supply products that are individually customised with minimal loss of manufacturing efficiency (Liu & Deitz, 2011:668). Salvador et al. (2009:71) undertook an extensive study of MC organisations, including 200 different manufacturing plants in eight countries. They found that the ability to reuse or recombine existing organisational value chain resources into a robust process design was one of the key determinants of successful MC implementation (Salvador et al., 2009:71,74).

Walcher and Piller (2012:5) define robust process design as the “capability to reuse or recombine existing organisational and value chain resources to fulfil differentiated customer needs”. Piller (2010:8), who built on the work of Salvador et al. (2009:71), concurred by stating that process design was one of the determinants in an organisation’s ability to mass customise. Robust process design ensures that the increased variability of MC can be fulfilled with near mass-production efficiency and reliability (Piller et al., 2012:5). The manufacture of mass customised goods is therefore a crucial phase of the whole product life cycle (Zangiacomi, Zhijian, Sacco & Boër, 2004:613). The manufacturing phase serves to ensure that the product that was designed by the customer adequately meets their needs and desires, whilst at the same time ensuring that this product is delivered within the agreed-upon time period (Zangiacomi et al., 2004:613).

According to Daboul, Bernard and Laroche (2011:170), whose research centred on MC in the footwear industry, MC leads to exponentially increased variation in
manufacturing. Furthermore, it is during the manufacturing phase that the majority of costs are incurred and that the quality and lead-time of a product are determined (Daboul et al., 2011:170). According to Zangiacomi et al. (2004:613) the manufacturing phase is especially important for mass customised clothing, as customer tastes and desires change rapidly. Senayake and Little (2010:283) concur by stating that the success of MC in clothing is especially dependent on the extent that the design and development, production and delivery of the goods are well handled. It is therefore essential that the MC business reconsider its production planning and scheduling and that it is prepared to evolve and adopt new tools if it hopes to efficiently satisfy customer needs (Zangiacomi et al., 2004:613).

2.4.1. The nature of MC manufacturing

In order to better explain the considerations of MC manufacturing, five unique characteristics of MC manufacturing are identified from the literature.

2.4.1.1. Inversion of supply chain

For mass manufacturers, production planning is possibly the most challenging aspect of applying MC, as it defies conventional supply chain management processes and the product development approach (Tseng & Hu, 2014: 840). Pan and Holland (2006:348), Skjelstad and Thomassen (2014:40) and Probst et al. (2013:3), who all look at the application of MC to a mass-manufacturing environment, agree that structural changes to the supply chain are the biggest implication of implementing MC. MC is essentially built around the customer and, as such, it requires the customer to be brought into the production stage very early on (Pan & Holland, 2006:348). In many ways, the traditional mass manufacturing supply chain has to be
inverted by bringing the customer to the early stages of product development (Sommer, 2014:63). According to Pine and Gillmore (2014:24) supply chains need to be replaced with demand chains so that raw materials are not converted into inventory on the basis of speculation but rather in response to actual demand.

2.4.1.2. Design-led push versus demand-pull

According to Senayake and Little (2010:283) manufacturing in response to actual demand has obliged the clothing industry to shift away from mass production. If one imagines a continuum of manufacturing strategies, pure mass production would be on one end and pure MC on the other (Claycomb et al., 2005:630). The distinction between these two extremes is the timing of customer orders relative to the final assembly of the item (Claycomb et al., 2005:630). Mass manufactured goods are assembled in anticipation of consumer demand (Claycomb et al., 2005:630). In order to pre-empt what customers will want retailers and/or manufacturers must act on behalf of customers (Pan, 2012:225). Therefore mass manufacturing is typically characterised by high levels of forecasting, or design-led push (Pan, 2012:224).

According to Senayake and Little (2010:283), in a mass-manufacturing paradigm suppliers and retailers overload the market with large quantities and varieties of clothing in anticipation of consumer demand. This phenomenon relates back to the forecasting errors discussed in Section 2.3.2. In this mass-manufacturing paradigm, the customer’s only input into the product is in their consumption behaviour (Senayake & Little, 2010:283). The customer is not integrated in the designing and manufacturing processes (Senayake & Little, 2010:283). MC, by contrast, involves the customer in the conception of the product (Senayake & Little, 2010:283). In a MC manufacturing paradigm, the order is first received before final assembly of the
goods commences (Claycomb et al., 2005:630). MC is therefore a demand-led pull with less of a design-led push (Pan, 2012:224).

Figure 2.5 illustrates the relative importance of the design-led push and the demand-led pull in both the mass manufacturing and MC systems. The demand-led pull in a MC shopping-environment is greater due to a shift to meet the demands of clothing consumers (Kincade, Regan & Gibson, 2007:629). Providing clothing consumers with choices that are designed, selected, and fitted specifically for an individual clothing consumer is the goal of MC (Kincade, Regan & Gibson, 2007:630). The point where the design-led push and the demand-led pull meet is known as the decoupling point.

![Push-Pull of Mass Manufacturing & Mass Customisation](image)

**Figure 2.5: Push and pull of mass manufacturing versus MC (adapted from Mehrsai, Karimi, & Thoben, 2013:33)**

### 2.4.1.3. Decoupling point

According to Senayake and Little (2010:287) the ‘customer order decoupling point’ (hereafter referred to as the decoupling point) is the point from which customer involvement in the final specifications of the product commences. Stated differently, the decoupling point is the boundary between make-to-stock (design-led push) and make-to-order (demand-led pull) (Lui, Choi, Yen & Ng, 2012:178). Piller (2010:13) refers to a partitioning of the supply chain: the first stage comprises of standardised products, while the second stage is based on customer preferences that have been
expressed in an order. The first segment therefore operates without perfect information on customer demand (forecasting), while the second segment operates after clarity on customer demand has been achieved (Chaudry & Hodge, 2012:65). Davis (1989:18) explains this duality, “every buy is customised, every sale is standardized”. According to Lui et al. (2012:178) the decoupling point is an important concept, as it allows business to structure value-adding activities in both manufacturing and logistics around this point. Understanding the placement of the decoupling point is therefore key to MC manufacturing (Lui et al., 2012:178). The practice of deciding on the decoupling point is closely related to the theory of postponement.

2.4.1.4. Postponement

According to Piller (2010:13) ‘postponement’, or ‘delayed production differentiation’, is a primary mechanism in the creation of a robust process design for MC. Chaudry and Hodge (2012:65) define postponement as “one of the strategies used to reduce production cycle times and time to market in order to respond to the changes in downstream demand on a real-time basis”. The theory of postponement is based on the postponement of manufacture until full knowledge of the customer’s requirements is known (Su & Chuang, 2011:25). Full postponement occurs when the entire design-make-ship cycle is only triggered upon the demand signal (order) (Su & Chuang, 2011:25). Although this would enable businesses to have virtually no waste in their process, thanks to perfect information (Su & Chuang, 2011:25), it would impact on their ability to utilise mass manufacturing efficiencies in their process (Piller, 2010:13).
Postponement in MC is therefore a balancing act between obtaining the economies of scale from mass production and the customer satisfaction that comes with perfectly meeting customer’s demands (Liu et al., 2012:178). Understanding the points and extent of customisation in the continuum from mass production to MC will allow MC clothing manufacturers to make accurate decisions about where best they can compete on this continuum (Senayake & Little, 2010:283). Su and Chuang (2011:25) concur, stating that the purpose of postponement strategies is for businesses to arrive at feasible solutions to customisation. Looking back at the made-to-measure suits retailer, used as an example in Section 2.3.5, they would have had to strategically consider their decoupling point and the degree of postponement, based on where best they thought they might be able to compete.

2.4.1.5. Product families

According to Piller (2010:13) the success of postponement rests on businesses offering a portfolio of products that consist of “product families” of closely related products. Hu (2013:4) defines product families as functional modules that are shared, “while others are provided with several variants so that the assembly combination will provide high variety in the final product”. Identifying product families involves two steps: firstly, determining the modularity of a product structure and, secondly, finding commonalities between the individual product variants (Yee, Wai, Ng, Au & Tseng, 2003:3). Figure 2.6 illustrates the product families found in a men’s shirt and how these were determined (Yee et al., 2003:5).
Figure 2.6: Product families in a men’s dress shirt (Yee, Wai, Ng, Au & Tseng, 2003:5).

The decoupling point, the level of postponement and product families therefore determine the nature of customisation that a manufacturer offers. The higher the level of product customisation that the manufacturer offers, the greater its manufacturing complexity (Piller, 2010:13). Increased product variety leads to a higher number of parts, processes and suppliers (Piller, 2010:13). Furthermore, increased product variety leads to increases in manufacturing cycle times (Su & Chuan, 2011:25). All of these drive operational costs upwards (Piller, 2010:13). The following section reviews literature that determines the main competencies that are needed for MC manufacturing in order to manage these complexities.
2.5. Competencies needed for MC manufacturing

Stump and Badurbeen (2012:113), in their study of existing literature on competencies needed by MC manufacturers, note that there have been few studies that collectively address the competencies needed for MC, particularly with regards to its manufacturing. Their literature review revealed four main competencies: flexible manufacturing, process modularity, centralised production and logistics planning, and organisational learning and continuous improvement (Stump & Badurbeen, 2012:113). Based on a wider literature review, the competencies identified by Stump and Badurbeen (2012:113) have been moderately adapted in this study. Modular processes are a form of flexible manufacturing; therefore these are discussed simultaneously as a single competency. Secondly, numerous authors have highlighted the importance of appropriate technologies to support manufacturing for MC, which led to the addition of this competency. Centralised production and logistics planning are both encapsulated in the third competency: an integrated and responsive supply chain. Since the fourth competency identified by Stump and Badurbeen (2012:113) is not specifically related to manufacturing and rather relates to general business practices it is not discussed further. This omission is also in line with the delimitations of this study discussed in Section 1.8. In order to achieve each of the three competencies discussed, certain sub-competencies should be present. These are also discussed below each competency.

2.5.1. Competency 1: Ability to undertake flexible manufacturing

Authors overwhelmingly agree that MC manufacturing requires flexibility in its processes (Brossog, Merhof & Franke, 2014:389; Claycomb et al., 2005:629;
Labarthe, Espinasse, Ferrarini and Montreuil, 2006:114; Pan & Holland, 2006:348; Pine, 1993b; Probst et al., 2012:12; Roh, Hong & Min, 2014:198; Senayake & Little, 2010:283; Stump & Badurdeen, 2012:109; Walczak, 2014:819-820; Xiaosong, Gensheng, Liu & Heim, 2011:1023; Yi, Ngai & Moon, 2011:272). Flexibility refers to the manufacturer's ability to respond to unanticipated environmental changes and dynamic changes in customer needs and preferences in its manufacturing process (Yi et al., 2011:272; Roh et al., 2014:198). Hu (2013:3) defines flexibility in manufacturing as a reconfigurable system that is utilised to “create high variety in the final assembly through combinational assembly, thus achieving the economy of scope”. In theory, flexible manufacturing systems should make it possible to modify a single item without a significant increase in costs (Walczak, 2014:819-820).

By its very definition flexible manufacturing practices allow manufacturers to simultaneously mass manufacture and manufacture for MC (Claycomb et al., 2005:630). This capability allows manufacturers to shift between servicing mass and niche markets without significant differences in costs between the two (Claycomb et al., 2005:630). According to Senayake and Little (2010:297) numerous MC clothing companies continue to both mass manufacture and mass customise. This flexibility leads to a sustainable competitive advantage (Claycomb et al., 2005:629). According to Labarthe et al. (2006:114) bringing about flexibility, speed and reactivity requires analysis and adaptation of existing and upcoming manufacturing and logistics systems. Operations, processes, interactions and flow coordination all need to be analysed and adapted (Labarthe et al., 2006:114).
2.5.1.1. Presence of flexible manufacturing systems

Daaboul et al. (2012:2429), Hu, 2013:4, Moutzis & Doukas (2014:3), Probst et al. (2012:15) and Walczak (2014:819) agree that a company wishing to implement a MC manufacturing strategy should, at the very least, have elements of lean manufacturing in place. Lean manufacturing was based on the Toyota Production System (Hu, 2013:5) and aims to simultaneously maximise value to the customer whilst eliminating waste along the process (Hu, 2013:5). Lean manufacturing aims to reduce all forms of waste, including time, in the value stream with the result of a level schedule (Naylor, Naim & Berry, 1999:108). Although lean manufacturing was initially applied to automotive production, it was soon adopted by clothing manufacturers who wanted to be more flexible, efficient and targeted in their approaches (Kincade, Regan & Gibson, 2007:628).

According to Manivelmuralidaran (2015:156-159) aspects of lean manufacturing are required in order to achieve agile manufacturing. Agile manufacturing aims to rapidly respond to market information, whilst allowing for high variety of styles (Brown & Bessant, 2003:707; Naylor et al., 1999:111). Agile manufacturing thus necessitates both reactive and proactive flexibility (Brown & Bessant, 2003:712). According to Bruce, Daly and Towers (2004:154) the manufacturer’s ability to respond to volatile fluctuations in demand is a clear indication of agility (Bruce et al., 2004:154). Furthermore, according to Brown & Bessant (2003:712), “mass customisation is best viewed as a powerful example of a firm’s ability to be agile”.

One of the most common methods for achieving agility in clothing manufacturing is Quick Response (Christopher, Lowson & Peck, 2004:372). Quick Response’s attraction is based on its ability to reduce lead-time by up to a third, greatly reducing
forecasting mistakes (Christopher et al., 2004:372). The premise is that reorder lead-times of 2-4 weeks enable retailers to replenish fashion styles while they are still in demand (Christopher et al., 2004:372). In order to manage flow and inventory within this system, work-in-progress must be closely monitored (Stump & Badurdeen, 2012:116). Zara is possibly the best-known global fashion retailer to have successfully implemented quick response (Yang, Qi & Li, 2015:1). Contrary to many fashion retailers, Zara is relatively vertical owning most of its manufacturing facilities. This enables the retailer to design, manufacture and deliver in four to five weeks (Persson & Mählkvist, 2014:1). Since fabric has been identified as a key factor in causing delays in the fashion supply chain (Persson & Mählkvist, 2014:1), Zara is prepared to hold stocks of fabric in order to decouple its clothing production from the long lead time of fabric production (Cheng & Choi, 2010:55). Another key tenet of the quick response model that Zara utilises is its use of postponement (Cheng & Choi, 2010:55). Only once it is assured of the demand for a certain product, is it cut and manufactured (Cheng & Choi, 2010:55).

The most cited flexible manufacturing system for mass customisation is modular production (Piller, 2010:15; Senayake & Little, 2010:290; Tseng & Hu, 2014:840; Xiaosong et al., 2011:1028). Modular production refers to a system that is made up of independent modular components that can be reconfigured into a wide range of end products (Mersai, Karimi & Thoben, 2013:30-31). The modules are configured from commonalities that exist in the product architecture (Tseng & Hu, 2014:369). A common platform is created for the various units identified during the product architecture (Tseng & Hu, 2014:369). This product platform is then said to hold a product family, made up of the various units identified at the product architecture stage (Tseng & Hu, 2014:369). The different product platforms largely form the
different modules (Tseng & Hu, 2014:369). So, rather than dividing processes into their smallest components, processes are grouped into modules (Kalaoglu & Saricam, 2007:93). Each module is therefore responsible for part of the manufacture of the final garment (Sudarsham & Rao, 2013:219). These modules are created to be as independent of one another as possible, which is referred to as loose coupling (Mersai et al., 2013:30-31). The reason for this loose coupling is that the modules should easily be able to be decoupled (Sanchez & Mahoney, 1996:64). The fact that the various modules are independently designed means that they can relatively easily be redesigned to satisfy customers’ heterogeneous needs (Tseng & Hu, 2014:1-2). This clear separation of functionalities differentiates a modular production system from other integrated production systems (Joeergensen et al., 2014:76). The lack of integration and the flexibility that comes with the ability to decouple modules has resulted in it being variously referred to as a reconfigurable production system (Tseng & Hu, 2014:841) and a flexible manufacturing system (Tomastik, Luh & Liu, 1996:789).

Modular production works best with demand-pull manufacturing, where the item is only manufactured on a customer’s order (Kalaoglu & Saricam, 2007:93). As such, it is highly compatible with MC. Another key advantage of modular production for MC is that it is able to accommodate product variety and change through the flexibility inherent in the various modules (Mersai et al., 2013:30-31). The system’s built-in ability to recombine the various process segments (modules) means that it is able to serve customer requirements without creating costly ad-hoc additions to the line (Zhang et al., 2014:116). The use of modules also results in better product quality and, as such, modular manufacturing is able to lend itself to more technically complex products (Baldwin & Clarke, 2003:150). This production method is also
associated with the lowest levels of work-in-progress (Kincade et al., 2013:4), which is an important consideration as work-in-progress results in capital being tied up in inventory. Aside from the appropriateness of modular manufacturing to MC, this form of manufacturing has also been found to increase employee morale and lower absenteeism (Sudarsham & Rao, 2013:219).

2.5.1.2. Adaptive Human Resources

Flexible manufacturing through modularity makes use of adaptive human capital (Bhattacharya et al., 2005:623). Employees and managers must be able to deal with novel and ambiguous tasks (Piller, 2010:15). Additionally, workers need to be able to work in decentralised and cross-functional teams (Stump & Badurdeen, 2012:114). This is particularly important for modular production, which is also referred to as a teamwork sewing system in clothing production (Lin, Moore, Kincade & Avery, 2002:50). Unless human resources are able to do this, any potential rigidness in the system will be constrictive (Piller, 2010:15). Considering operator skill, management style and available training is therefore imperative prior to introducing this form of production (Kincade et al. 2013:12). Claycomb et al. (2005: 629-636) similarly state that flexibility is a combination of physical characteristics, operating policies and managerial practices. Yi et al. (2011:272) found that flexibility was initially proposed as a management philosophy to enable managers to respond to inflexibilities in production. Due to the relatively high level of responsibility of operators with this form of production (Sudarsham & Rao, 2013:228), these considerations are all the more important. Management also need to be able to envision what a future production solution might look like (Piller, 2010:15), which requires a design mind-set. Operators
and management therefore need broad knowledge that extends beyond their immediate functional specialisation (Piller, 2010:15).

Although modular production systems have been in use since the 1980s, it is one of the newest production systems in the clothing industry (Kincade et al., 2013:4). This form of production is also referred to as the team method, as the system consists of teams of operators that function as single units (Kincade et al., 2013:4). The American Apparel Manufacturing Association states that these manageable work units are comprised of 5-17 people performing a measurable task (Kalaoglu & Saricam, 2007:93). The operators rotate around several machines as they assemble or sew the pieces into a garment. Quality is then measured on the team’s output and incentives are most often built around this (Kalaoglu & Saricam, 2007:93). Once the overall process design has been determined, teams are given the freedom to organise themselves in order to meet the production goals (Sudarsham & Rao, 2013:228). The module team is responsible for ensuring a smooth workflow, meeting production goals, maintaining a specified level of quality and remaining motivated as a team (Sudarsham & Rao, 2013:228). For this reason, modular production is the most interactive of all production forms requiring employees also need to have strong relationship skills (Piller, 2010:15).

2.5.2. Competency 2: Supportive technologies

Although the concepts of “flexibility” and automation may once have seemed incongruous, they have been greatly enabled through improvements in technology (Piller, 2010:14&15). It is the presence of emergent technology that has largely driven the potential for MC (Anderson-Connel et al., 2002:242; Ghandi et al., 2014:6;
Probst et al., 2012:12). According to Walczak (2014:818), it is the integration of IT and manufacturing systems that defines MC in relation to previous manufacturing approaches, as these are responsible for reducing the trade-off between flexibility and productivity (Senayake & Little, 2010:297; Xangiacomi et al., 2004:613; Xiaosong et al., 2011:1036). According to Addis and Holbrook (2001:51), the leading companies use flexible manufacturing technologies, flexible and knowledgeable workers and new management tools to “shorten their cycle times, lower their costs, enhance their flexibility and responsiveness, and increase their variety and customization”. Potter et al. (2004:479) agree by stating that the timeliness of information, which is critical to successful MC, is completely dependent on information technology. Harzer (2013:95) maintains that with higher investments in flexible manufacturing systems enterprises generally have higher sales growth, higher returns, earnings growth and market share. The sub-competencies for implementing MC manufacturing with information technology follow.

2.5.2.1. Investment in supportive technologies

There are ranges of information technology based systems that can be utilised in order to manufacture for MC (Liu & Deitz, 2011:669; Xiaosong et al., 2011:1026). Based on an extensive review of literature Fogliatto et al. (2012:19) concluded that Computer Aided Design (CAD) is still the most frequently cited form of advanced manufacturing technology. The ability to integrate CAD with new 3D technologies and the customer interface makes it all the more pertinent (Fogliatto et al., 2012:19). CAD also provides enterprises the possibility of avoiding manual labour and improving precision, productivity and the flow of information through the organisation (Dabolina & Vilumsone, 2012:63). CAD technology is used by clothing enterprises
from the conceptual design stage into product development and all the way through to the production process (Zang, 2014:1190). CAD software enables the development of the garment through sketching, the creation of the pattern from this sketch, the grading of the pattern into various sizes and the ability to visualise the garment in a three dimensional way prior to making (Dabolina & Vilumsone, 2012:63). Additionally, CAD software is able to calculate the amount of fabric that will be necessary, how to best lay out the pattern pieces and to calculate the level of complexity with regards to the production of the garment (Dabolina & Vilumsone, 2012:63). The automation of these processes significantly decreases time and reduces waste (Dabolina & Vilumsone, 2012:63).

2.5.2.2. Integration

According to a study by Bellemare, Carriere and Baptiste (2014:94) it is a resistance to advances in technology that has caused the clothing industry to implement MC in a tardy fashion and with great difficulty. The resistance is partly explained by a lack of integration between current technologies used by the clothing industry and those needed to implement MC (Bellemare et al., 2014:94). Bellemare et al. (2014:99) found that the 61% of organisations that had relatively non-integrated technological systems had inadequate performance measures. The need to adequately integrate various information technology systems in order to succeed in MC has been cited by numerous other authors (Cincom, 2008:1; Ghandi et al., 2014:7; Probst et al., 2012:6; Roh et al., 2014:208; Senayake & Little, 2010:297; Xiaosong et al., 2011:1038).

According to Ghandi et al. (2014:7) it is only with an integrated approach to technologies that true scale can be achieved in MC, leading to visibility, flexibility,
control of product flows and automation of tasks. In their study of MC points in the clothing industry, Senayake and Little (2010:297) found a link between integrated information technology systems and market leadership. This finding clearly illustrates the importance of finding the right technology and working across departments to ensure its integration (Ghandi et al., 2014:7). Xiasong et al. (2011:1038) also warn of simply purchasing more information technology for the shop floor does not lead to superior MC capabilities for manufacturers. Instead Xiasong et al. (2011:1038) advise manufacturers to seek out information technology that will specifically direct the manufacturer towards a greater customer, or demand-led pull, focus.

2.5.2.3. Technological literacy
Bellemare et al. (2014:94) also found that the fashion industry’s relative lateness in implementing MC can be explained by management and operators’ lack of technical comprehension (Bellemare et al., 2014:94). Dabolina and Vilumsone (2012:63) support this view by stating that improving operator knowledge is essential in the use of CAD software. Probst et al., (2012:3) also believe that having adequately skilled IT professionals involved early on in the process greatly reduces manufacturing errors. According to Probst et al. (2012:3), attracting the best talent from established IT companies is a challenge for enterprises wishing to mass customise. Pan (2012:229) states that the clothing industry is especially prone to hiring practices that do not attract the best talent needed to realise MC strategies. Another key strategy for improving technological literacy is adequately training operators and managers in order to improve employee morale and boost performance (Bellemare et al., 2014:94).
2.5.3. Competency 3: An integrated and responsive supply chain

Numerous authors agree that supply chain integration and responsiveness are a necessity for the MC enterprise (Cincom, 2008:2; Daaboul et al., 2010:2427; Labarthe et al., 2006:398; Mehrsai, Karimi & Thoben, 2013:29; Mikkola & Skjøtt-Larsen, 2004:353; Pan, 2012:229; Probst et al., 2013:2,15; Potter et al., 2004:473; Roh et al., 2014:207-208; Liu & Deitz, 2011:676; Walczak, 2014:818; Yi et al., 2011:272; Xiaosong et al., 2011:1029; Zangiacomi et al., 2004:613). Supply chains influence the MC manufacturer’s ability to organise and coordinate a stream of complex products through design, sourcing, manufacturing and distribution strategies (Mikkola & Skjøtt-Larsen, 2004:353). In the clothing industry, supply chains consist of fibres, machinery and chemicals suppliers, textile and clothing manufacturers, retailers and fashion agencies, service providers and independent experts (Mahmood & Kess, 2015:488). MC depends on the successful integration of all these different participants (Cincom, 2008:2).

According to Yi et al. (2011:272) the concept of flexibility needs to be expanded from MC manufacturing to include supply chain scenarios. Mehrsai et al. (2013:29) allege that a flexible supply chain creates the agility and responsiveness needed in order to undertake MC. According to Roh et al. (2014:207), traditional supply chain strategies that focus on cost-efficiencies and stability are not suitable to a contemporary customer-centric, or design-pull, global business environment. The authors suggest a responsive supply chain strategy that allows for adaptability to rapidly-evolving consumer demands, whilst at the same time reducing waste throughout the chain (Roh et al., 2014:208). In order to transform their supply chains from production-
driven, or design-led push, chains companies need guidance (Potter et al., 2004:473).

As more participants become involved in the supply chain, the relationships among them become increasingly complicated (Labarthe et al., 2006:398; Yi et al., 2011:272). These increasingly complex relationships result in more sources of uncertainty for manufacturers to deal with, such as market demand, product quality and information flow (Yi et al., 2011:272). For this reason, it is essential for manufacturers thinking of entering the MC paradigm to start by considering supply chain issues (Probst et al., 2012:15). According to Daaboul et al. (2010:2427) the enterprise should ascertain whether its supply chain is in fact capable of managing MC and to then plan for the changes that will be required if it isn’t. The sub-competencies needed for the existence of an integrated and responsive supply chain follow.

2.5.3.1. Information sharing
According to Liu and Deitz (2011:676), MC capability is “built upon the acquisition or development of customer-facing and supplier-facing operant resources”. The MC manufacturer must implement socio-relational integration with its customers and strategic suppliers (Roh et al., 2014:208). Numerous authors cite the necessity of information sharing in order to achieve integration and flexibility in the MC supply chain (Chaudry & Hodge, 2012:70; Mikkola & Skjøtt-Larsen, 2004:353; Probst et al., 2013:2,15; Pan, 2012:229-230; Potter et al., 2004:479; Roh et al., 2014:208; Walczak, 2014:819; Zangiacomi et al., 2004:613). Information sharing consists of developing open communication channels with strategic suppliers to ensure constant flows of updated information about market dynamics and demand patterns (Roh et
al., 2014:198; Probst et al., 2013:2,15). According to Labarthe et al. (2006:398) information sharing can lead to new forms of networked organisations with transformed business processes. However, the variety and volume of data that needs to be shared in the MC supply chain requires information flows that are effectively configured if they are to deliver value to the supply chain (Pan, 2012:230; Mikkola & Skjøtt-Larsen, 2004:353).

The most important tool for information sharing in the MC supply chain is technology in the form of product data management systems (Roh et al., 2014:208; Pan, 2012:229). Zangiacomi et al. (2004:613) state that external suppliers should be connected to the factory through the Internet by specific web supply management tools. Roh et al. (2014:208) suggest Electronic Data Interchange (EDI), Enterprise Resource Planning (ERP) and the Extranet as points of contact between the MC manufacturer and its supply chain.

Chaudry and Hodge (2012:70), who studied supply chain structures in the clothing industry in relation to postponement theory, uncovered information sharing practices processes used by clothing enterprises. Firstly, there is a long-term orientation in supplier relationships, for example, one of the case study enterprises ensured its suppliers had a year’s visibility on their orders (Chaudry and Hodge, 2012:70). Secondly, communication takes place at multiple levels: there is a strategic exchange at the top-level, a tactical exchange on a seasonal level, and an ongoing exchange of updated forecasts (Chaudry and Hodge, 2012:70). Lastly, suppliers are able to update their production status on the company’s system so that there is a two-way flow of information (Chaudry and Hodge, 2012:70).
2.5.3.2. Collaborative planning

Liu and Deitz (2011:677), Mikkola & Skjøtt-Larsen (2004:353), Pan (2012:230) and Xiaosong et al. (2011:1029) all recommend collaborating and making joint decisions with supply chain partners at the planning phase. Liu and Deitz (2011:677) maintain that this practice results in lead-time reduction and products that better meet customer demands. Collaborative planning might include any of the following: the quantity and location of raw materials, subassemblies and finished products, available production capacity and other resources located throughout the supply chain (Xiaosong et al., 2011:1029). To ensure alignment, the following tools can be utilised: joint performance measures, joint performance monitoring and collaborative forecasting (Min et al., 2005:248). The key is to have a formalised, well-thought-out plan together with the flexibility to ensure agility in the face of unplanned events (Liu & Deitz, 2011:677).

2.5.3.3. Modelling and simulation

Orchestrating the flow of mass customised goods through a supply chain involving multiple stakeholders requires complex decision-making and continuous adjustment (Labarthe et al., 2006:398). The complexity of this process and the impact of supply chain decisions necessitate careful study prior to implementation (Labarthe et al., 2006:398). Process modelling is one of the ways through which the supply chain flow can be anticipated (Labarthe et al., 2006:400). Supply chain models can be analysed in order to evaluate agility in the supply chain and to anticipate their reaction to various environmental dynamics (Labarthe et al., 2006:400). Labarthe et al. (2006:400) suggest that even more accurate than modelling is simulation. Simulation uses models and methods to imitate the behaviour of the supply chain physically
Figure 2.7 is a conceptual framework drawn from the literature discussed in Section 2.5, which illustrates the identified competencies and sub-competencies needed for the successful implementation of mass customisation in clothing manufacturing.

![Conceptual framework](image)

**Figure 2.7: Conceptual framework of the identified competencies needed in order to successfully implement MC (Researcher's own compilation, 2015)**

### 2.6. Summary of Chapter 2

According to Pine and Gillmore (2014:24) most manufactures have not taken up the opportunity to shift from mass manufacturing to MC. Additionally, of the companies who have taken up MC, 17% have failed within the first year due to implementation problems (Nielsen, Brünoe, Joergenson & Taps, 2014:359). In some cases, the
implementation of MC was even found to jeopardise the existence of the companies (Nielsen et al., 2014:349). According to Abnett (2015), while the opportunities are clear, MC can be hard to operationalise. The competencies needed by firms in order to successfully operationalise their MC strategies should be considered by firms prior to commencing MC. According to Stump and Badurdeen (2012:113), very few studies have collectively addressed all the competencies needed for MC. This literature review has sought to address this problem by defining three main competencies and their sub-competencies directly influencing manufacture from the literature on MC. Chapter 3 follows with the research methodology to be employed in this study.
3.1. Introduction

In this chapter, the research approach and method are explained. The research strategy is first laid out, including the research population, instrument and methodology. Steps taken to ensure the reliability and validity of the data are then discussed. This is followed by the ethical implications of the study and, finally, the limitations of the study are stated.

3.1.1. The research questions

In order to address the aims and objectives of the study, the main research question is: How suitable is MC for South African clothing manufacturers?

The research sub-questions are:

**Research question 1**: What are the main competencies that South African clothing manufacturers need to have in place prior to engaging in MC?

**Research question 2**: How do three South African clothing manufacturers measure up against the identified required competencies for the implementation of MC?

**Research question 3**: In instances where the required competencies for MC are not present in the three clothing manufacturers, why is this the case?

3.2. Research strategy

The paradigm that was adopted for this study is pragmatism. A pragmatic approach places the research question at the forefront of the research and allows flexibility in either positivist or interpretivist philosophies (Saunders, Lewis & Thornhill, 2009:109).
The pragmatic paradigm is concerned with the “what” and the “how” of research problems (Wilson, 2014:10), which is in line with this study’s research questions. The pragmatic paradigm advocates responsiveness in research, creating opportunity for reflection during the research process (Hookway, 2015). This study was reflexive in the way that the competencies initially identified in the literature review (Chapter 2) were revised to include new information from the findings (Chapter 4).

The study takes an inductive approach, as data was collected and then developed into a theory as a product of the data analysis (Saunders et al., 2009:124). This approach is in line with the exploratory aim of this study. The purpose of induction is to build theory (Saunders et al., 2009:125). Since there is very little known about the suitability of MC for South African clothing manufacturers, the purpose of this study was to build theory. According to Zigmund, Babin, Carr and Griffin (2013:47), inductive reasoning follows a logical process of establishing a general proposition, based on facts. The identification of a conceptual framework to guide the study allowed for this logical process.

Qualitative research is often inductive in its approach (Babbie & Mouton, 2011:270). According to Babbie and Mouton (2011:53), the goal of qualitative research is describing and understanding, rather than explaining or predicting. The exploratory aim of this study calls for descriptive data, which implies that the study’s methodology is qualitative. Another key feature of qualitative research is its aim of gathering in-depth, “thick” descriptions and understandings (Babbie & Mouton, 2011:270).

This study’s research strategy is a case study, which exists to enable such in-depth, “thick” descriptions. Another defining feature of qualitative research is that it is undertaken by “staying close” to the subject (Babbie & Mouton, 2011:53). Since this
study makes use of unstructured interviews, this closeness is inherent in its design. The most important condition for differentiating between various research methods is to look at the type of research question being asked (Yin, 2009:10). Questions are generally categorised into “who”, “what”, “where”, “how” and “why” questions (Yin, 2009:9). Questions that are categorised as “what” lend themselves to either surveys or archival analysis (Yin, 2009:8). Question 1 of this study is a “what” question and it is therefore answered by interrogating the existing literature on MC.

Questions that are categorised as “how” and “why” lend themselves to case studies, histories and experiments (Yin, 2009:8). Since neither histories nor experiments are suited to this study, the case study was employed. Yin (2009:18) defines a case study as an “empirical enquiry that investigates a contemporary phenomenon in depth and within its real-life context”. The case study also enables a rich understanding of processes being enacted (Saunders et al., 2009:144), which relates to the need to understand the suitability of a MC strategy within the identified South African clothing manufacturers. Given that there are three clothing manufacturers that were interviewed, the study is a multiple case study (Yin, 2009:61). Additionally, because there is a single unit of analysis (South African clothing manufacturers), the case study is holistic in nature (Yin, 2009:46).

3.2.1. Research population

All three research questions in this study require knowledge to be gained from existing South African clothing manufacturers. The sampling method utilised in this study was purposive sampling. According to Babbie and Mouton (2011:166), purposive sampling is based on the researcher’s judgement and the purpose of the
study. It is therefore a strategic and convenience sampling method (Bryman & Bell, 2011:429). The findings of studies undertaken with purposive sampling do not represent any meaningful population (Babbie & Mouton, 2011:166). As such, the findings from the three clothing manufacturers are meaningful only to themselves and cannot be applied to further clothing retailers without corroborating the findings through further research. Since the aim of this study was explorative, it is not a requirement that the results should represent a meaningful population of South African clothing manufacturers. Also, due to the limited scope of the study, it was not feasible to include all South African clothing manufacturers in the research population. However, the decision to interview three respondents is useful in providing a measure of triangulation.

Based on this scope, South African manufacturers with the greatest likelihood of being able to mass customise were identified. According to MacCarthey (2013:7337), MC is especially viable for niche clothing manufacturers, such as corporate clothing. Corporate clothing manufacturers deal with great variety in styles and order quantities. Suiting and shirting corporate clothing manufacturers also provide an element of fit MC, as uniforms are somewhat tailored to individual customers. Since the implementation of MC is a sequential and progressive process (Daaboul et al., 2012:2482), it follows that these corporate clothing manufacturers may be most suited to MC. Also due to the limited scope of the study and its explorative aim, all of the selected manufacturers had head offices based in Johannesburg, in close proximity to the researcher. This was a form of convenience sampling.

Since this study is focussed on manufacturing, the production managers or technical directors were selected as respondents within the corporate clothing organisations. In
order for the respondents to be able to answer the broad range of questions posed of them they also preferably needed to be a member of the executive board. The third respondent was purposively sampled because her company is slightly larger than the other two respondents. This provided an important additional perspective to the study. A profile of the respondents is in Table 3.1 is a summary of key information on the respondents and their respective companies.

<table>
<thead>
<tr>
<th>Manufacturer 1</th>
<th>Company Type:</th>
<th>Corporate clothing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Johannesburg (head office and factory)</td>
<td></td>
</tr>
<tr>
<td>Employees:</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Machines:</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Position:</td>
<td>Managing Director and Operations Manager</td>
<td></td>
</tr>
<tr>
<td>Responsibilities:</td>
<td>Sales, range development, raw materials purchasing, patterns and cut-sheets, garment engineering, logistics</td>
<td></td>
</tr>
<tr>
<td>Time in the position:</td>
<td>2.5 years</td>
<td></td>
</tr>
<tr>
<td>Industry experience:</td>
<td>22 years</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturer 2</th>
<th>Company Type:</th>
<th>Corporate clothing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Johannesburg (head office and sampling)</td>
<td></td>
</tr>
<tr>
<td>Free State (factory)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees:</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td>Machines:</td>
<td>190-200</td>
<td></td>
</tr>
<tr>
<td>Position:</td>
<td>Technical Director</td>
<td></td>
</tr>
<tr>
<td>Responsibilities:</td>
<td>Raw materials purchasing, garment engineering, production</td>
<td></td>
</tr>
<tr>
<td>Time in the position:</td>
<td>6 years</td>
<td></td>
</tr>
<tr>
<td>Industry experience:</td>
<td>43 years</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Manufacturer 3</th>
<th>Company Type:</th>
<th>Corporate clothing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Johannesburg (head office and factory)</td>
<td></td>
</tr>
<tr>
<td>Employees:</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Machines:</td>
<td>250-300</td>
<td></td>
</tr>
<tr>
<td>Position:</td>
<td>Production Director</td>
<td></td>
</tr>
<tr>
<td>Responsibilities:</td>
<td>Range development, raw materials purchasing, patterns, production</td>
<td></td>
</tr>
<tr>
<td>Time in the position:</td>
<td>14-15 years</td>
<td></td>
</tr>
<tr>
<td>Industry experience:</td>
<td>20-21 years</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1: Respondents’ profiles (Researcher’s own compilation, 2015)
3.2.2. Research instrument

This study made use of semi-structured interviews (Appendix 1 and 2). The use of interviews is one of the most common instruments used to gather qualitative data (Babbie & Mouton, 2011:289). Interviews tend to be divided into standardised and non-standardised interviews (Saunders et al., 2009:321). Qualitative interviews are characterised as being flexible, iterative and continuous (Babbie & Mouton, 2011:289), or non-standardised. Non-standardised interviews are especially useful in answering “what”, “how” and “why” research questions (Saunders et al., 2009:321), such as those in this study. Furthermore, they are suited to exploratory research, as they provide the possibility of probing interviewees in order to better explain or build on their responses (Saunders et al., 2009:321). Yin (2009:107) also states that interviews used in case studies are likely to be fluid, rather than rigid. There are two types of non-standardised interviews: semi-structured interviews and in-depth, unstructured interviews (Saunders et al., 2009:320).

Semi-structured interviews are utilised in instances where the researcher follows an interview guide to ensure that specific topics are covered (Bryman & Bell, 2011:481). The interview guide exists to ensure that the study’s aim and objectives are being met. A discussion on the methodology used in drawing up the interview guide follows in Section 3.2.3. Further to this interview guide, additional questions were asked as themes arose during the interview or in an effort to probe (Bryman & Bell, 2011:481). To ensure fluidity, questions were also asked in a different order depending on the interview (Bryman & Bell, 2011:481). Typically of non-standardised interviews (Saunders et al., 2009:348) and due to the respondents’ geographical proximity, the interviews were face-to-face. An initial interview lasting between one and two hours
took place with each respondent. Following the transcriptions of the interviews (Appendix 2), one of the respondents was asked to clear some concepts up and to provide further information via email.

3.2.3. Research methodology

The method employed in this study is grounded theory. This is in keeping with the inductive approach of this study. There is a continual interplay between data collection and analysis in grounded theory, leading to theory building (Bowen, 2006:1), which aligns with this study.

In order to answer the first research question, the competencies that clothing manufacturers need in order to engage in MC first had to be identified. In order to achieve this goal, literature was consulted in Chapter 2. Congruence in the literature was sought in order to identify which competencies were most important for clothing manufacturers to have prior to implementing MC. Furthermore, the relative importance of authors, as determined by the frequency with which they were cited, also added weight to certain authors’ perspectives on the pertinence of the competencies required for clothing MC manufacturing. The identified competencies are summarised in a conceptual framework in Figure 2.7 of Chapter 2. These competencies are the sensitising concepts that framed this study.

Sensitising concepts provide a theoretical foundation for grounded theory (Bowen, 2006:1). Sensitising concepts are used as interpretive devices where a starting point for a qualitative study is sought (Bowen, 2006:2). It is expected that these sensitising concepts will be tested, improved and refined during the course of this study (Blumer, 1954:7). According to Padgett (2004:301) concepts emergent from the data “may
supplement them or displace them altogether”, allowing for reflexivity. These sensitising concepts form a conceptual framework, which is used to guide the study (Bowen, 2006:3). The conceptual framework of the sensitising concepts found in Chapter 2 was used as a basis for interview question generation, thus guiding the research. Figure 3.1 below is a diagram of the conceptual framework and the questions pertaining to each sensitising concept (also in Appendix 3 in a larger format).

![Conceptual framework with question numbers pertaining to each sensitising concept](Author's own compilation, 2015)

Figure 3.1: Conceptual framework with question numbers pertaining to each sensitising concept (Author’s own compilation, 2015).

In order to answer the second question, it had to be determined whether the three South African clothing manufacturers had the required competencies for the implementation of MC. In order to determine this, semi-structured face-to-face interviews were conducted with each manufacturer. The interview guide was used to ask questions that would determine whether the competencies required for the
implementation of MC were present in the three clothing manufacturers. In order to answer the third research question, the reason for the identified competencies not being present had to be identified. In order to identify these, the respondents’ answers needed to be probed whilst they were being interviewed. This probing was enabled by the relative freedom of the semi-structured interview.

The interviews were transcribed and analysed using coding. The data collection and analysis technique provided by Corbin and Strauss (1990:3) in their article on grounded theory served as a model. The data was analysed according to themes (Strauss & Corbin, 1990:6). “Indicators of phenomena” were extracted from raw data and conceptual labels or themes were given to these (Strauss & Corbin, 1990:6). Themes that related to the same phenomena were then grouped into concepts (Strauss & Corbin, 1990:6). A coding table was used to categorise the data (see Appendix 4 for a sample).

3.3. Reliability and validity

According to Yin (2014:45), reliability and validity of case study research carry four tests. Three of these are relevant to exploratory research (Yin, 2014:45). The first test is construct validity (Yin, 2014:46). Constructing validity refers to the extent to which a study investigates what it claims it investigates (Farquhar, 2012:101). In order to meet this requirement, the ideas and concepts that have formed the basis of the study must be clearly identified (Farquhar, 2012:101). Furthermore, it should also be clear how the measures used in the research are going to address these concepts and ideas (Farquhar, 2012:101). The ideas and concepts that formed the basis of
this study were clearly identified in Chapter 2 as the competencies that clothing manufacturers were required to have prior to the implementation of MC.

The second test is external validity (Yin, 2014:48). Although case studies do not allow for statistical generalisation, they should allow for some level of analytical generalisation (Gibbert, Ruigrok & Wicki, 2008:1468). Whilst this study is exploratory, it does aim to provide some recommendations towards the broad suitability of MC for South African clothing manufacturers, if at all possible. These recommendations require some level of analytical generalisation. This generalisation was aided by the use of three case studies, allowing for triangulation (Gibbert et al., 2008:1468), thereby increasing validity. It was also aided by providing a rationale for the case study selections and the case study context (Gibbert et al., 2008:1468) in Section 3.2.1.

3.4. Ethical considerations

Ethical considerations in business research relate to the rights and obligations of concerned parties (Zigmund et al., 2013:88). The most important rights and obligations of the participants are informed consent and confidentiality (Zigmund et al., 2013:88). Informed consent means that participants are clear about what the research is about and what their participation is to entail (Zigmund et al., 2013:88). Since the respondents’ participation was active in this study, the participants were provided with information detailing the purpose of the study and what their involvement required. A copy of the blank consent form is included in Appendix 5. Since respondents are expected to answer questions truthfully, they have a right to expect confidentiality (Zigmund et al., 2013:88). This means that respondents’
identities and the identity of the companies for whom they work should be maintained as confidential (Bryman & Bell: 2011:136). This study took care to ensure that the reporting of the data did not lead to the respondents or their organisations being identifiable. Additionally all signed consent forms have been securely stored by the researcher to maintain this anonymity.

The researcher also has rights and obligations (Zigmund et al., 2013:88). The most important are objectivity and the truthful representation of research (Zigmund et al., 2013:96). Objective scientific research should be an objective at every step of the research process (Zigmund et al., 2013:96). It is unethical to misrepresent research (Zigmund et al., 2013:96). Instead, research must be reported in full and in an honest way (Zigmund et al., 2013:96).

3.5. Limitations

Since the aim of this study is exploratory, it is geared towards gaining a broad insight and comprehension of MC and its suitability for South African clothing manufacturers, rather than accurate and detailed data (Mouton & Babbie, 2011:80). While case studies may not allow for statistical generalisation, they do allow for analytical generalisation (Gibbert et al., 2008:1468). These generalisations were, however, limited by the fact that only three cases were studied. This is a result of the limited scope of a minor dissertation. In addition to this, the study resides in the discipline of Business Management and focuses only on the manufacturing and not the retailing of mass customised clothing in South Africa. This leaves opportunities for further research of a Marketing focus with regards to MC although it is a conceivable separation since there are numerous instances in existing clothing MC where a MC
clothing retailer outsources its manufacturing. Lastly, due to the limited scope of a minor dissertation and the exploratory nature of the study, it does not seek to answer questions on the financial feasibility of implementing a clothing MC manufacturing strategy for existing South African clothing manufacturers.

3.6. Summary of Chapter 3

This chapter explained the research methodology that was used in this study. The four research questions were first stated. The research design was then discussed. It was established that this study seeks to exist within the pragmatic paradigm and follows an inductive approach. The need to do qualitative research and the decision to do a multi-case study were then discussed. The reason for undertaking purposive sampling was justified and the two cases (clothing manufacturers) that formed part of this study were then introduced. The semi-structured interview was justified as the research instrument. How each of the research questions will be answered formed the basis of the research methodology and the concept of coding was introduced as a data analysis tool. This study’s constructive and external validity were then discussed, together with its reliability. Ethical concerns were considered in terms of the rights and obligations of both the participants and the researcher. Lastly, the limitations of the study were set out. Chapter 4 follows with an interpretation of the findings.
CHAPTER 4
INTERPRETATION OF THE FINDINGS

4.1. Introduction

Chapter 4 is an interpretation of the findings obtained from the study and a discussion of these findings. The data from the interviews was coded according to emergent themes, as per Section 3.2.3 (Corbin & Strauss, 1990:3). These themes revealed certain sub-concepts, which were, in turn, whittled into main concepts. Identified themes that are not immediately relevant to the aims and objectives of the study are still discussed for their general interest and the value that they may hold for future studies. The findings are discussed in relation to Chapter 2 so that they might be considered against the existing body of research and theory in this field. New literature is also drawn upon to better explain the findings or to support contradictions between the findings and the literature referenced in Chapter 2. The concepts and sub-concepts that have emerged from the findings are compared to the original sensitising concepts that were identified in the conceptual framework (Figure 2.8; Section 3.2.3) (Bowen, 2006:3). A revised conceptual framework thus emerges from the findings.

4.2. Concept: Ability to undertake flexible manufacturing

1 states the following in reference to variances in order quantities: “You have to be flexible in your manufacturing in order to be able to cater for that”. Manufacturer 2 states, “We can have a production line running on trousers now and we can change that line to make shirts or jacket or, whatever the case may be, so the flexibility has to be there”. For Manufacturer 3 flexibility in manufacturing enables “changing the style, changing colour, prioritising different customers”.

4.2.1. Sub-concept: Presence of flexibility

There are two types of themes that emerged from the interview data in support of the presence of flexible manufacturing systems. The first type relates to instances that necessitate the presence of flexible manufacturing systems. These are: large variances in order quantities, a high level of customisation, large variances in styles and the presence of simultaneous mass manufacturing in the factories. The second type of themes relate directly to the presence of flexible manufacturing systems. These are: agile manufacturing, lean manufacturing, quick response and modular production.

4.2.1.1. Theme: Order quantity variances

According to Roh et al. (2014:198) and Yi et al. (2011:272) (Section 2.5.1), flexibility refers to the manufacturer’s ability to respond to unanticipated environmental changes and dynamic changes in customer needs and preferences in its manufacturing process. Order quantity variances are an indication of a manufacturer’s ability to respond to changes in customer needs. Manufacturer 1 said that “it [orders] varies from 30 to 100 to 5,000 to 10,000” and that his factory is geared to handle “minimum orders of 30 and maximum orders of...20,000”.
Manufacturer 2 said that his orders vary from “one garment to 1,000 garments”. Manufacturer 3 has a minimum order quantity of one and the highest quantity mentioned is 5,000. While Manufacturer 1 is able to manufacture higher quantities, the current minimum order quantity of 30 does not allow for true customisation, which is the single garment. Both Manufacturer 2 and Manufacturer 3 currently have minimum order quantities that allow for customisation.

**4.2.1.2. Theme: Level of customisation**

According to Walczak (2014:819-820) (Section 2.5.1), flexible manufacturing systems should make it possible to modify a single item without a significant increase in costs. All the respondents offered different levels of customisation. Manufacturer 1 was reluctant to supply the single customer: “You can’t tell me that every person here goes to [a fashion retailer] and asks them to make a size ‘this’ - crap!” and, “You want lounge shirts I'll make you lounge shirts, any colour you want, but I'm not going to make one at 38cm and one at 90cm”. Manufacturer 2 and Manufacturer 3 both physically measure their clients’ staff in order to determine which sizes from the range will best fit them. Manufacturer 2 states, “We have fitting ranges, which they will try on”. Manufacturer 3 states, “We go to your facility and you fit on what you’re going to order”. Manufacturers 2 and 3 both deal with what they term “specials”. Manufacturer 2 explains special orders as being for “people who fall out of those fitting ranges”. While Manufacturer 3 tries to minimise these by offering a larger size offering and reserves special orders, for example, for “people with hunchbacks or one arm that we make uniforms for”. In terms of the costs involved in custom orders, Manufacturer 1 clearly does not budget for this:

“Now you’ve got to pay for a fitting team. You have to travel, send them up and down to every branch. Where does that cost [cover] come from?”
Manufacturer 2 says that he has to charge a surcharge because of “the cost involved” and, since his company offers fit-to-measure, in certain instances “specials are a huge problem”. Manufacturer 3’s company seemed better able to absorb the extra costs involved in “specials”:

> “the flexibility of changing the style, changing colour, prioritising different customers. It costs money, yes it does. But we’ve got the management strength and our setup is… I think it’s suitable”.

Only Manufacturers 2 and 3 embrace true customisation. Although Manufacturer 3’s company seems already better able to cushion the cost of customisation, this may be due to the fact that they have a larger size curve and therefore can do fewer “specials”, hence less customisation.

4.2.1.3. Theme: Simultaneous mass manufacturing

According to Claycomb et al. (2005:630) (Section 2.5.1) flexible manufacturing practices allow manufacturers to simultaneously mass manufacture and to manufacture for MC. All three respondents managed both small runs and mass orders at once. Despite manufacturing for a “school ordering 30 tracksuits”, Manufacturer 1 had also had an order of “about 180,000 garments for a period of four months” from large fashion retail chain. Manufacturer 2 mentioned four times that small runs are challenging: “one of the big challenges in the production of corporate clothing is that you’re doing small runs”, “custom make those garments and the runs are small”, “the biggest thing is the small runs and, obviously, the small amounts of fabric that you’re going to need for those”, and “so the smaller runs are, like I said, a big problem”. However, he stated that “there are ways and means of getting around them” and that the big “roll-out is not a problem to handle because it’s mass production”. Manufacturer 3 also stated that, despite the cost of custom work, “there are the niceties of 700, 800, 5,000 of the same thing”. Although Manufacturer 3’s
company outsources a lot of its larger production runs, their factory is also able to handle these: “it’s a monster factory to feed so there are times that we do the bulk because we have the capacity” and “in the quieter times we bring back some of the hundreds, seven hundreds and thousands to do internally and that just boosts our production output significantly”. Manufacturer 3’s company uses mass quantities to balance out “peaks and the valleys” in their production: “we do realise that if we have the correct balance we’re as efficient as a factory that just does bulk runs”. While Manufacturer 1 seems to handle larger order quantities, Manufacturer 3 seems better able to achieve mass manufacturing efficiencies even with some custom orders. This relates back to the capability of shifting between mass and niche markets without significant costs (Claycomb et al., 2005:630) (Section 2.5.1). Also proving the three respondents’ ability to simultaneously mass and custom manufacture is the fact that all three used the bundle system¹, which is generally associated with mass manufacturing (Lee & Chen, 1999:3). Manufacturers 2 and 3 use it together with other manufacturing methods.

4.2.1.4. Theme: Style variances

Large variances do not only exist in the number of different units being manufactured in the three respondents’ factories but in the different styles of products that they manufacture. Manufacturer 1 states, “we make everything from lounge shirts, jackets, safety wear, trousers, blouses…I don’t know…shorts, T-shirts, golf shirts, …name it…chinos, pretty much anything you can think of”. Manufacturer 2 says that their production line makes anything from trousers, shirts, jackets “or whatever the case may be”, including both ladieswear and menswear. Manufacturer 3 manufactures

¹ Bundle system: The bundle system is comprised of cut parts of the garment, tied into bundles to complete one or more sections of an apparel product. Traditionally associated with the mass manufacture of clothing. (Das & Patnaik, 2015:85).
everything except menswear, jerseys and shoes. According to Manufacturer 1, it is essential to manufacture a wide range of products:

“This is how you manage in this industry because if you only make lounge shirts, by crikey, you’ll go out of business sooner or later because you might make loads of lounge shirts now but six months later when winter comes and no one wants lounge shirts then what do you do? Shut down your factory?"

4.2.1.5. Theme: Presence of lean manufacturing

Daaboul *et al.* (2012:2429), Probst *et al.* (2012:15) and Walczak (2014:819) (Section 2.5.1.1) agree that a company wishing to implement a MC manufacturing strategy should, at the very least, have elements of lean manufacturing in place. Manufacturer 1 predominantly subscribed to lean manufacturing practices. Technically, the factory is owned by his business partner: “He plans the production lines, I just make sure he’s got the work”. He also outsources his patternmaking: “My pattern maker is outsourced…because I can’t afford to keep a permanent pattern maker on tap”. His factory also hires both full-time and part-time staff as “you can have nothing today and everything tomorrow” (in reference to orders). Save the sewing machines, all operations within the factory are manual. In fact, lean practices seem ingrained in the outlook of Manufacturer 1: “a wise man once said if you make bottles, don’t make the labels”. This outlook is explained by Purvis *et al.* (2014:101) who state that lean and agile manufacturing systems tend to, not only be manufacturing systems, but also contain philosophical values and cultural elements. Although not to the same extent, Manufacturer 3 also has lean practices, as her company outsources: “We also make use of a lot of CMTs" so we manufacture about 50% of our garments and the others are made out".

---

2 CMT: “A firm that is contracted to Cut, Make and Trim from fabric, findings and cutting marker” (Das & Patnaik, 2015:25).
4.2.1.6. Theme: Presence of agile manufacturing

Agile manufacturing aims to rapidly respond to market information, whilst allowing for high variety of styles (Naylor et al., 1999:111) and it is indicative of a firm’s ability to mass customise (Brown & Bessant, 2003:712) (Section 2.5.1.1). All three respondents showed some evidence of agile manufacturing in their ability to continuously change styles in their factories. Manufacturer 1 referred to this as “jiggling”: “you might be running three, you might be running five lines of garments and reduce it to four to put another order through or reduce it to three to put another two orders through”. Furthermore, Manufacturer 1 states that he does “whatever’s necessary [to] slot in the new orders” in order to honour deadlines. Manufacturer 2 states that his factory “can have a production line running on trousers now and we can change that line to make shirts or jacket or whatever the case may be” and, “we can have up to four, five style changes every day on a line”. Manufacturer 3 expresses it thus: “we can either say we want to have all the navy pairs of pants going down the line so that you don’t have everybody changing thread or we can say, you know what, let’s do all the green blouses and then all the red blouses and then the purple blouses”.

4.2.1.7. Theme: Presence of quick response

One of the most common methods for achieving agility in clothing manufacturing is through quick response (Christopher et al., 2004:372) (Section 2.5.1.1). Manufacturer 2 was approached by two leading South African fashion retail chains to quick response manufacture, or what he terms “speed-to-market”. Manufacturer 3 explains that they use a business philosophy similar to Zara’s quick response model (Yang et al., 2015:1) (Section 2.5.1.1): “quicker and quicker and quicker turnaround”. She talks
about the customer’s expectation as, “not necessarily what you can offer them” but “how quickly you can get it to them”. Manufacturers 1 and 3 are able to get repeat stocks to their customers in a four-week period, relating back to the two to four week lead time that Christopher *et al.* (2004:372) (Section 2.5.1.1) consider necessary for quick response. Manufacturer 3 explains:

“Being in one building, one factory, we can chop and change. We can prioritise customers. We do our own internal embroideries so…under one roof, easy to…easier to manage and control, especially the smaller quantities”.

This relates back to the advantages of being vertical when manufacturing for quick response (Persson & Mählkvist, 2014:1) (Section 2.5.1.1). Both Manufacturers 2 and 3 also hold fabric stocks, relating back to the need for quick response manufacturers to avoid the delays associated with fabric production lead times (Cheng & Choi, 2010:55) (Section 2.5.1.1). Manufacturer 2 states, “I think that helps make us a little bit more competitive in the market because we do keep model stock and I think it’s important” and, “You’d be silly to try and not keep stock of fabrics”. Manufacturer 3 also holds fabric, even importing it under their own name: “We tend to carry between three and six months’ stock”. While Manufacturer 2 holds some fabric of his own, he mostly expects the clients to own the fabric that will be used for their repeat orders: “We make sure that they sign a clause where they are responsible for the fabric”. Manufacturer 3 also states that holding fabric, rather than made-up garments, is key to postponement, in relation to holding stock she states, “preferably raw material because we can convert it, you know, you can never get the size curve correct much ahead of time”. Postponement is both an important concept in quick response (Cheng & Choi, 2010:55) (Section 2.5.1.1) and it is also a key tenet of MC (Chaudry & Hodge, 2012:65; Piller, 2010:13; Su & Chuang, 2011:25) (Section 2.4.1.4).
4.2.1.8. Theme: Presence of Modular Production

Both Manufacturers 2 and 3 also have elements of modular production in their manufacturing. Manufacturer 2 knew of modular production. He had tried to fully implement it in the sample department but found that, “to an extent it works but you need to have slightly bigger runs [than those of a sample room] for that to work”. Manufacturer 2 has partly implemented it in the factory: “the only modules that we do implement are prep sets or pre-prep sets where all the standard operations are basically done in that area”. Examples of items that would be manufactured in pre-prep are “jet pockets, bolt pockets, things that are standard on every garment, shirt pockets if it’s a blouse”. This is in line with what Baldwin and Clarke (2003:150) (Section 2.5.1.1) say about modular production lending itself to more technically complex products. Once these are manufactured by the modules in pre-prep they are then fed onto the production lines: “If there’s a pocket to be set it’ll be set before it goes onto the line so that the line basically becomes more an assembly than what it is a preparation”. While Manufacturer 2 credits modular production in pre-prep for the reason that they are “so successful in producing the smaller runs and also having the style changes not affecting us that much” he cautions against going fully modular in production stating that, “you need larger production runs” and that “you can’t really implement it here [in South Africa]”. This echoes a study by Senayake (2004:298), which found that combining mass production and mass customisation manufacturing systems is feasible, although limited to the volume of mass customisation styles, the extent of customisation and the point of customisation.

Although Manufacturer 3 was not familiar with the term “modular production”, her factory also seems to employ this method in part. Manufacturer 3 has “production lines [that] are set up into mini little factories” consisting of “smaller little teams of
people” with “about 20, 25 people in a team”. Furthermore, “within that team it is broken into preparation, and then smaller little teams with a team leader” forming “little cells [that] are functioning independently”. In the end, these modules are responsible for the construction of the final garment. Manufacturer 3 states, “It’s little departments within the bigger picture […] in the end, they are giving me 40, 45 blouses an hour”. This is in line with Sudarsham and Rao (2013:219) (Section 2.5.1.1) who state that each module is responsible for part of the manufacture of the final garment.

According to Tseng and Hu (Tseng & Hu, 2014:369) (Section 2.5.1.1) modules are configured from commonalities that exist in the product architecture, otherwise knows as product families (Piller, 2010:13) (Section 2.4.5.1). Both Manufacturers 2 and 3 use these commonalities or product families to achieve mass efficiencies in their manufacturing. Manufacturer 2 says, “It’s those little bits and pieces that become the problems and that’s where the small and the in-house range and that type of thing come in where you throw everything into one pot to try and increase your runs per style and manufacture”, which ultimately “increases the amount of garments per style that we then make”. Also according to Manufacturer 2, “The styling might be slightly different but it can still run on the same production line”. Manufacturer 3 gives examples of the commonalities that they look for: “if I have 25 of the same style but split into different colours” or “you do all the green, you do all the red”. Manufacturer 3 states that the smaller units are kept for their own factory where they “do the fruit salad”: “the one, one, ones, across 50 million colours and whatever else”. These statements echo Hu (2013:3) (Section 2.5.1.1) who states that high variety in the final assembly is achieved through combinational assembly.
The flexibility that comes with the ability to decouple modules has resulted in it being variously referred to as a reconfigurable production system (Tseng & Hu, 2014:841) and a flexible manufacturing system (Tomastik, Luh & Liu, 1996:789) (Section 2.5.1.1). All three respondents change their lines regularly. However, Manufacturer 2 is the most open to change: he states that the setup “changes continuously, continuously” in order to allow for the 150 different styles that they need to produce on average every month. Furthermore, Manufacturer 2 also changes “the lines to put machinery into place so we have smooth flows”. Manufacturers 1 and 3 are more reluctant to change the machinery around, instead leaving machines not needed dormant or walking to less utilised machines. Manufacturer 1 states that it is more a question of “demographics”: “although the lines are geared for and set up for those extras, whether they choose to put two people on overlocking or one person on straight-stitch – that’s the demographics of it”. Manufacturer 3 says, “We don’t necessarily move around machinery, we move around people”. According to Manufacturer 3 the factory is “limited in terms of space”. Manufacturer 1 says that “the only time we really change it is if we get huge orders for like, you know, for Legit or for Edcon or one of those”, as one “can’t always move the whole factory around, otherwise it’s a very big job” and “by the time you’ve moved everything up and down you’ve lost half a day”. The reluctance of Manufacturer 1 in particular may be indicative of a leaner approach to manufacturing, which was discussed earlier (Section 4.1.1.6).

Modular production works best with demand-pull manufacturing, where the item is only manufactured on a customer’s order (Kalaoglu & Saricam, 2007:93) (Section 2.5.1.1). According to Manufacturer 3, “every garment I manufacture already belongs to a person”. She uses the example of a nurse working for a private hospital group:
“when we run our cutsheets\textsuperscript{3} that garment is for a person”, “that person might order a pant now and a jacket the next month and three months later they want their winter uniform”. This is in contrast to, for example, “a Woolies store [where] you’re making 500 blouses or 5,000 and it’s a possible sale at the other end”. The demand-pull is a feature of corporate clothing production that Manufacturer 3 describes as “contract work”. This demand-led pull has led Manufacturer 3 to find “that it’s a lot about servicing the customer”. Manufacturer 1 somewhat agrees, stating that “the corporate market is very difficult because nine times out of ten you’ve got to make something for them”. The fact that Manufacturer 1 also manufactures for large fashion retail chains may explain his reluctance to demand-pull. Manufacturer 2 states, “everybody wants their own identity and you know so you’ve got to try and be flexible”. This design-led pull, rather than design-push, is a key distinguishing factor of MC that was discussed in (Section 2.4.1.2). According to Claycomb \textit{et al.} (2005:630) in MC the order is first received before final assembly of the goods commences.

4.2.2. Sub-concept: Adaptive and effective human resources

According to Bhattacharya \textit{et al.} (2005:623) (Section 2.5.1.3) flexible manufacturing through modularity requires adaptive human capital. Adaptability in staff is evidenced in their ability to work in teams and in their wide range of skills. The presence of training, as a theme, was also placed under this sub-concept, as it relates to both of these. Although the productivity of human resources in a flexible manufacturing environment was not given much attention in the literature review in Chapter 2, this theme emerged from the interview data and was therefore added to the revised

\textsuperscript{3} Cutsheets: “A detailed breakdown showing each garment and which sizes it comes in, how many of each size, how many of each colour, trim colours to fabric colours and any other relevant details; together these instructions are a ‘cut-sheet’” (Simpson, 2009).
conceptual framework. Since the effectiveness of the human resources is as important as its adaptability, the sub-concept was changed to include this.

4.2.2.1. Theme: Teamwork

According to Piller (2010:15) (Section 2.5.1.2), modular production is the most interactive of all production forms requiring employees to have strong relationship skills. As per Section 2.5.1.2 (Lin et al., 2002:50) both Manufacturers 2 and 3 make use of teams in order to achieve elements of modular production. Manufacturer 2 says that teams are especially utilised in pre-prep, where modular production takes place in his factory. Manufacturer 3 explains how the teams operate on her factory floor: “each line has got their own individual teams of people” who are “not just sitting behind the machines sewing” but who represent other departments on the production line, for example, the Quality Control Department. The teams are managed by team leaders: “we’ve got a team leader, that’s the person that, in our terms, would probably be able to complete a garment from start to finish because, if there’s a problem, she needs to be able to show the others how and what to do”. By contrast, Manufacturer 1’s factory has line supervisors who are entirely responsible for meeting the production output demands: “[the supervisor] knows what each of their key members are capable of doing and therefore they manage them accordingly and put them on the right machines accordingly and give them the right jobs accordingly”.

4.2.2.2. Theme: Multi-skilled operators and management

According to Claycomb et al. (2005: 629-636), Kincade et al. (2013:12), Piller, (2010:15) and Sudarsham & Rao (2013:228) (Section 2.5.1.2) operators and management need broad knowledge that extends beyond their immediate functional specialisation. According to Manufacturer 1, “your staff need to be extremely
qualified” and “you’re not talking about Mickey-Mouse guys off the street that just walk in today and sew”. Rather, “you’ve literally got to have guys that can do everything, from looking at a pattern to checking a marker⁴ to be able to make sure that there isn’t a cuff missing or a sleeve short or there’s a fusing mark on a single” so “they need to be multi-trained”. Manufacturer 2 agrees that “the flexibility of the operators” needs to be there and that “the key to having this whole thing work is that your operators have to be multi-skilled”. All three respondents strongly agreed that their operators were sufficiently skilled. In fact, Manufacturer 2 attributes his company’s success in corporate wear to his operators being multi-skilled. According to Manufacturer 1, the line supervisors are “not good, they’re brilliant” and “they are all capable of being their own factory managers if they want”. Manufacturer 3’s team leaders are also capable of completing a garment from start to finish. Manufacturers 1 and 2 even have Technical Directors who are able to sew garments on every machine in their factories in the same time that they expect their staff to. Manufacturer 1 states that his factory manager and business partner “can operate every single machine there” and “he’ll sew 10-15 garments at once”. Manufacturer 2 states that “the Technical Director like myself down has to have an understanding of garment construction and production” because “I mean if I can’t put a garment together how can I expect somebody to put it together themselves?”.

4.2.2.3. Theme: Training

According to Kincade et al. (2013:12) (Section 2.5.1.2) training is essential when introducing modular production. Both Manufacturers 2 and 3 have a training school. Manufacturer 2 states that the operators “will keep rotating in and out of the training

⁴ Marker: “A plan for cutting the pattern pieces for a specific garment style” (Mankey et al., 2003:323).
Manufacturer 2 maintains, “The training is very, very important to us”. Manufacturer 3 states, “We have a training school where we constantly... train our operators on overlockers, for instance, or box-stitching or whatever”. Manufacturer 3’s company then have a pool of qualified machinists to choose from when recruiting. Both Manufacturers 2 and 3 seem to have stabilised their staff complement through their internal training, although they are both concerned about the lack of young new entrants into the industry. Manufacturer 3 states that “there’s no youngsters that come into this industry, they want to be doctors and professors”. However, Manufacturer 2 finds a way around this by ignoring the minimum qualification level set by the SETA and training applicants with only grade eight or nine school certificates. Manufacturer 3 has found that providing smart uniforms for the factory staff is especially important to the “youngsters”. Manufacturer 1, in keeping with his lean management philosophy, does not have a training school and only hires staff with qualifications, although his line supervisors do teach operators how to use machines. Where there are gaps in their knowledge: “they’ll sit with a team member and show them how to do something and teach them how to do something and then obviously they’ll leave them to carry on but manage it, supervise it”.

4.2.2.4. Theme: Productivity

Stump & Badurdeen (2012:116) (Section 2.5.1.1) state that, in order to manage flow and inventory within a flexible production system, work-in-progress must be closely monitored. Following on from this is the productivity of the human resources. All three respondents maintained the importance of achieving productivity within a flexible
manufacturing environment. Manufacturer 1 states, “you’re working on time” and “the amount of time it’s going to spend on the line determines how much time they’re going to have to put into it”, “you’ll get the odd pile from time to time but generally there’s a flow, a flow from the top to the end” and “it’s like this: quick, quick, quick”. Manufacturer 2 states, “down-time is probably - like overtime - it’s time that you cannot recover and it’s very important to keep an eye on the downtime” and “you have to be hands-on, constantly driving and making sure that your production is coming out”. Manufacturer 3 states that “cell phones aren’t allowed on the factory floor […] those kind of bylaws seem crazy but it is a manufacturing environment” and “they get paid by the minute and my units are count by the minute so I can’t afford…[staff] on the phone and going to the bathroom for 15 minutes while the rest of the line [waits]…it will affect the output”.

One of the chief factors affecting productivity for Manufacturer 2 is absenteeism. Although the presence of modular production should theoretically reduce absenteeism (Sudarsham & Rao, 2013:219) (Section 2.5.1.1), Manufacturer 2 has his factory in a peri-urban area in the Free State Province where alcoholism in “the demographic areas where [his staff] are” is quite high. He states, “You’ll find that on a Monday they just don’t come to work so that is a big problem for us”. The factory has implemented “all sorts of incentives and whatever to try and prevent it but…whatever, it’s just a problem”. Manufacturer 2 maintains that, “absenteeism is a huge factor in this country” so “you have to have back-up plans and try to get around those issues”. Manufacturer 2 has created a pool of extra operators to try and combat the absenteeism. These extra operators double as float operators who are used “where there are bottlenecks on the line, you take them and you plug them in, let them help sort out that problem and move them onto the next job”. He uses this extra pool of
operators for “controlling your flow of your work and making sure that your targets are met every hour”. Secondly, both Manufacturers 2 and 3 make use of back-up teams of mechanics in order to maintain the machines, which will be discussed further under the concept of technology in the following section. Manufacturer 2 also utilises the General Sewing Data (GSD) system to understand the time that operations take and how much downtime there is. Both Manufacturers 2 and 3 also use other techniques to keep their staff motivated. Manufacturer 2 states that they almost always promote from within, while Manufacturer 3’s organisation aims to create a familial atmosphere through various initiatives and in-house corporate branding. In contrast, Manufacturer 1 maintains productivity by using a “piece-work” system to pay employees, rather than paying them by the hour. According to Manufacturer 2, using piece-work as a remuneration method is “against the rules and regulations of the Bargaining council for the clothing and textile workers to which we are members and SACTWU agreements” and that these companies are actually "non compliant". However, Manufacturer 2 admits that “if you don't have proper system or controls” to monitor productivity on an hourly pay system, piece-work is a more productive method. The systems and controls in place in Manufacturer 2’s factory will be discussed further under the concept of technology.

Following, is a summary of the findings on the manufacturers’ ability to undertake flexible manufacturing (Section 2.4). Firstly, evidence of the need for flexibility was established. While Manufacturer 1 has great variance, his minimum order quantity is 30, rather than the single item that both Manufacturers 2 and 3 are capable and/or

---

6 GSD system: “General Sewing Data provides the ability to establish and quantify each step or operation in the manufacturing process (GSD, 2015).

7 SACTWU: Southern African Clothing and Textile Workers’ Union
willing to manufacture. In terms of the level of customisation offered by the respective manufacturers, only Manufacturers 2 and 3 offered customisation. All three respondents simultaneously mass manufactured, evidenced by their volumes and their use of the bundle system. This enabled all three to balance their production to achieve maximum outputs. All three respondents manufactured a wide range of garments under one roof, further displaying a need for flexible manufacturing practices. In terms of the manufacturers’ responses to the need for flexibility, Manufacturer 1 seemed the leanest. All three respondents had agility built into their manufacturing practices.

Manufacturers 2 and 3 also have elements of quick response in their manufacturing. Manufacturers 2 and 3 both seem to have a version of modular production in their factories. Furthermore, both Manufacturers 2 and 3 seem to already have MC practices entrenched in their organisations: both make use of product families to gain mass efficiencies in the production of these items; both postpone the styling decision until the customer has placed the order, preferring to hold fabric and trims in stock; both are wholly demand-pull. In fact, Manufacturer 3’s statement that “we do realise that if we have the correct balance we’re as efficient as a factory that just does bulk runs” is clear evidence of MC manufacturing abilities: integrating heterogeneous needs with the efficiency of mass production so that similar cost advantages are achieved to those of mass production (Tseng & Hu, 2014:838) (Section 2.2). While Manufacturers 2 and 3 both place value on teamwork, Manufacturer 1 prefers to rely on supervised teams. All three respondents seem to have multi-skilled operators and managers in place. Again, only Manufacturers 2 and 3 provided formal training on a continuous basis. In terms of the productivity of their staff, all three respondents
highlighted the importance of this consideration. Each respondent also found different ways to maintain the productivity of their staff, however Manufacturers 2 and 3’s methods possibly reflect more advanced managerial practices better suited to the implementation of MC. A summary of the themes, sub-concept and concept is illustrated in Figure 4.1:

![Figure 4.1](image)

**Figure 4.1:** The ability to undertake flexible manufacturing as a concept with the themes and sub-concept that emerged to support it (Author’s own compilation, 2015).

### 4.3. Concept: Supportive technologies

According to Anderson-Connel *et al.* (2002:242), Ghandi *et al.* (2014:6) and Probst *et al.* (2012:12) (Section 2.5.2) emergent technologies have largely driven the potential for MC. Data relating to the presence of potentially supportive technologies was initially identified. Secondly, the integration of these different technologies was explored. Finally, data relating to the technological literacy of its users is discussed.
4.3.1. Sub-concept: Presence of aiding technologies

Four themes emerged in favour of this sub-concept. The different types of manufacturing technologies are grouped under one theme. CAD and ERP are each discussed as separate themes and, finally, the findings relating to the appropriateness of these technologies is discussed.

4.3.1.1. Theme: Manufacturing technologies

Harzer (2013:95) (Section 2.5.2) maintains that with higher investments in flexible manufacturing systems enterprises generally have higher sales growth, higher returns, earnings growth and market share. Manufacturer 2 has a Switchtrack system in his factory. Switchtrack is an automated overhead transporter system that consists of tracks “where your garments are hooked onto a chain”. Manufacturer 2 describes the process thus: “you start off from the cutting room where they come in bundles, we have a loader who loads every piece or whatever of that garment onto a chain in sequence […] the first operator knows that when she takes she always takes from the same peg and she puts back on the same peg […] it becomes such an automated thing that they just take it and they know exactly what they’re doing”. Manufacturer 2 maintains that this system is “one of the easiest ways to run a small-run operation” and that it provides a “higher degree of production control and bottleneck identification”, as well encouraging flexibility in manufacturing. Manufacturer 3 disagrees with this view, stating that it can become a nightmare to have one style overtake the next, due to the system being on a chain. Manufacturer 3’s company has however invested in a host of important manufacturing technologies, these include: “under/over trimmers”, “an automatic jet pocket machine”, “15 head embroidery machines”, “automatic jacket pressing equipment”,

78
“shoulder presses”, “collar presses”, “jacket basting machines”, and “sleeve setting machines”. Quite a few of these investments are either more energy efficient or they will permit the company to manufacture menswear in the near future.

4.3.1.2. Theme: CAD

Based on an extensive review of literature Fogliatto et al. (2012:19) (Section 2.5.2.2) concluded that Computer Aided Design (CAD) is still the most frequently cited form of advanced manufacturing technology required for MC to exist. All three respondents use the Lectra system to do their CAD. Lectra is one of the largest global suppliers of software to the textile and apparel industries (Anderson, 2005:3). Manufacturer 1 has CAD capabilities through the patternmaker that he outsources. Manufacturer 1’s patternmaker has the Lectra patternmaking software and marker making software, which lays the pattern-pieces out. Manufacturers 2 and 3 both additionally have Lectra automatic cutters. These are directly linked to the marker software, allowing automatic integration from the patternmaking studio to the factory floor. By contrast, Manufacturer 1’s cutting is manual. According to Manufacturer 3, these automatic cutters “cut extremely fast, much faster than the manual cutters, much more accurate”, which echoes the findings of Dabolina and Vilumsone (2012:63) (Section 2.5.2.2). Manufacturer 3’s automatic cutters are unique in their ability to cut small plies enabling small quantities. Manufacturer 2 has Lectra software with 3D modelling capabilities: “I think we are the most advanced, as far as the Lectra system is concerned, in the country, we are already onto 3D and all those packages”. According to Manufacturer 3 this is “the latest, latest technology”. Fogliatto et al. (2012:19) (Section 2.5.2.2) also state that the integration of CAD with new 3D
technologies is especially useful for MC. Both Manufacturers 2 and 3 therefore have the requisite CAD software for MC.

4.3.1.3. Theme: ERP

Manufacturer 3 has “spent R6 million on [an ERP] system over the last 3 years and we’re only starting to implement it now”. Manufacturer 3 states they are the first in the country that, to her knowledge, are using a system called Cincom. The system will “be managing our wardrobes, stock, inventory, invoicing - complete solution”. Manufacturer 3 notes the immediacy with which orders are remotely captured: “I can literally see what [a Hospital] ordered while they’re still there”. She also highlights the system’s ability to improve the company’s access to key information during the ordering process, such as the anniversary date and size of a customer’s last order. Furthermore, the system will improve their visibility on model stock, which is currently manually counted: “the information that you have now versus what you have tomorrow could be 20,000m [of fabric] difference”. Roh et al. (2014:208), Pan (2012:229) and Ziangcomi et al. (2004:613) (Section 2.5.1.3) all briefly mention the possibility that ERP systems might enable MC, specifically assisting supply chain communication. However, Moutzis and Doukas (2014:10) and Jitpaaiboon and Sharma (2012:146) both warn of the costs associated with these systems. Jitpaaiboon and Sharma (2014:10) state that these systems are likely to be less important for SME MC manufacturers, due to ERP systems’ capital intensive nature. Furthermore, Moutzis and Doukas (2014:10) and Ahmad, Schroeder and Malick (2010:56) both warn that reported successful implementation of ERP systems are limited
4.3.1.4. Theme: Appropriateness

Manufacturers were asked whether they were satisfied that the technologies available in their companies supported manufacturing. Manufacturer 1 stated that “everything in our business is manual” and “the only automation in our business is our machinery, that’s it”. According to Manufacturer 1 all other tasks were manual: “there is no conveyer belts, no forklifts…there is nothing automated” and “everything else is packed by hand, inspected by hand, checked by hand, labelled by hand, boxed by hand, shipped by hand”. This is in keeping with Manufacturer 1’s lean approach. Manufacturer 2 responded with “totally” when asked, “They have the right manufacturing technology, the right equipment”. Manufacturer 3 stated, “we’re really happy with what we have”. Both Manufacturer 2 and 3 felt that their technology was sufficiently up-to-date. Manufacturer 2 said, “I’ve tried to keep the machinery as modern as possible”, “as far as our competitors are concerned – we’re pretty cutting edge, we’re on the forefront of what we’re capable of” and “we’ve got the latest and the best”. Manufacturer 3 stated, “we try for our machinery to not date too quickly […] we upgrade processes and equipment when funds are available or when need arises”. According to Bellemare et al. (2014:94) (Section 2.5.2.2) it is a resistance to advances in technology that has caused the clothing industry to implement MC in a tardy fashion and with great difficulty. Both Manufacturers 2 and 3 seemed to exhibit quite the opposite: enthusiasm and pride for new technologies.

4.3.2. Sub-concept: Integration

According to Bellemare et al. (2014:94) (Section 2.5.2.2) the clothing industry’s lateness in implementing MC is partly explained by a lack of integration between current technologies used by the clothing industry and those needed to implement
MC. Again, Manufacturers 2 and 3 both felt that their technologies were well integrated. This integration is evidenced in the automation present in both factories. Both Manufacturers have automatic manufacturing technologies and pattern cutting technologies. Manufacturer 2 notably has the *Switchtrack* system, which allows full automation and control of the production flow. When asked how automated their processes are, Manufacturer 2 states that they are “at the 80% point but there’s room for improvement but, once again, we’re capping it because of the skills to maintain”. Meanwhile, Manufacturer 3 has the *Cincom* ERP system that will offer a “complete solution”, although Moutzis and Doukas (2014:10) warn that there are technological issues with ERP systems and integration is one of these.

**4.3.3. Sub-concept: Technological literacy**

Bellemare *et al.* (2014:94) (Section 2.5.2.3) also found that the fashion industry’s relative lateness in implementing MC can be explained by management and operators’ lack of technical comprehension. Both Manufacturers 2 and 3 have mechanics in the factory to repair machines as they break down in order to prevent downtime. Manufacturer 3 finds that often, however, they “need the expertise from outside” but that, “because the industry in Gauteng is really small […] there’s a week’s delay in getting something, rather than instant when the industry was big here”. Manufacturer 2 has a very good IT technician but worries that he is “past retirement age already” with no succession plan. Manufacturer 3 also finds that the service from *Lectra* can be particularly slow, given that the communication goes from Durban to France and back again. However, Manufacturer 2 states that *Lectra* “can also be repaired remotely from France if required”. Manufacturer 2 repeatedly states that “you have to keep a balance between what your technical people are capable of
doing” and the technology that is invested in. He states, “going fully automated has its disadvantages as well because, once again, we do not have the technical skills to maintain the machines” and “I mean we’d love to automate anything and everything but to keep it sustainable and to keep the machinery running you need the skills to maintain it”. Manufacturer 2 implies that it is necessary to remain realistic: “because we know what the capabilities of our technicians are, even though we send them on courses”. Manufacturer 2 explains that attracting the right calibre of person is tough. This underscores what Probst et al. (2012:3) (Section 2.5.2.3) found, that attracting the best talent from established IT companies is a challenge for enterprises wishing to mass customise. Manufacturer 2 explains that this difficulty is partly geographical: “The type of person that you’re going to attract to be a technician in [a peri-urban town in the Free State] is not somebody that’s going to be highly, highly in demand”. Whilst the poor salaries that the industry pays are also a problem: “what they’re paying people to come into the industry is a pittance, so I’d rather go work in a bank”. This last point echoes in the literature: Pan (2012:229) (Section 2.5.2.3) states that the clothing industry is especially prone to hiring practices that do not attract the best talent needed to realise MC strategies.

To summarise the concept of supportive technologies (Section 4.3), both Manufacturers 2 and 3 have the technologies in place to undertake MC. Manufacturer 1 has paid access to patternmaking technologies but, beyond that and aside from the machines, his process is manual. Manufacturer 1 would therefore be hampered in implementing MC. Both Manufacturers 2 and 3 also have integration between all their technologies. According to Manufacturer 2, his factory is 80% automated. However, further advances in technologies by both Manufacturers are
likely to be hampered by a lack of technological literacy in the industry. Figure 4.2 illustrates the themes and sub-concepts that emerged in support of this concept.

![Diagram: Supportive technologies as a concept with the themes and sub-concepts that emerged to support it (Author's own compilation, 2015)]

**Figure 4.2: Supportive technologies as a concept with the themes and sub-concepts that emerged to support it (Author's own compilation, 2015)**

### 4.4. Concept: Stable supply base

According to Probst *et al.* (2012:15) and Daaboul *et al.* (2010:2427) (Section 2.5.3) it is essential for manufacturers thinking of entering the MC paradigm to start by considering supply chain issues in order to determine whether their supply chains are in fact capable of managing MC and to then plan for the changes that will be required if they are not.
4.4.1. Sub-concept: Stable supply

Numerous authors agree that supply chain integration and responsiveness are a necessity for the MC enterprise (Cincom, 2008:2; Daaboul et al., 2010:2427; Liu & Deitz, 2011:676; Labarthe et al., 2006:398; Mehrsai et al., 2013:29; Mikkola & Skjøtt-Larsen, 2004:353; Pan, 2012:229; Potter et al., 2004:473; Probst et al., 2013:2,15; Roh et al., 2014:207-208; Walczak, 2014:818; Xiaosong et al., 2011:1029; Yi et al., 2011:272; Zangiacomi et al., 2004:613) (Section 2.5.3). However, all three respondents questioned the very concept of a supply chain in the South African context. When asked whether his company had ever simulated their supply chain, Manufacturer 2 stated, “our supply chain in this country is very, very small so I think that’s one of the biggest problems when you say, ‘modelling the supply chain’”. He went on to say, “we don’t have very many suppliers that you can compare against […] you might have one or two label suppliers, one or two fusing suppliers”. Manufacturer 3 concurred, “You know the other thing is just sometimes you just don’t have a choice […] you’re either dictated by the customer, some of the government contracts say you will use this supplier, or it is just not available locally so with very short lead time you have very little choice”. Manufacturer 1 agrees that there is not necessarily a choice in suppliers: “If you’re stuck with somebody’s specific shade [fabric colour] and you’ve got to go back to them, you’re kind of forced, you don’t have a choice”.

4.4.1.1. Theme: Small local industry

Both Manufacturers 1 and 2 attribute this to the near-demise of the textile mills in South Africa. Manufacturer 1 states, “years ago we had these huge factories, I mean 20 years ago we had companies like Pan Textiles, they employed 4,000 people and
they knitted...I don’t know...15,000 jerseys a day [...] those don’t exist anymore”. Manufacturer 2 does not see this changing: “who in the right mind or who has the type of money to go and set up a mill [or] a fusing factory?”. He defends his position by stating that “it’s huge capital investment, not to mention the labour – training of labour and where are they going to come from?”. The result is that, regardless whether the respondents were buying local or imported fabrics or trims, the pool of suppliers from which they can choose is too small to really deem it a true supply chain. Manufacturer 2 illustrates just how small the supply ‘chain’ is:

“You might have one or two label suppliers, one or two fusing suppliers. Generally what we do is we buy from both because something can happen to either one of them and you sit with the problem”.

4.4.1.2. Theme: Fabric availability

Manufacturer 1 and 2 both repeatedly mentioned the problem of sourcing fabrics. Manufacturer 1 explains it thus:

“You can get an order today and there’s no fabric. There’s no fabric. Customer still wants the goods”.

When asked what the biggest stumbling block to the implementation of MC in South Africa might be, Manufacturer 2 states, “First of all, there’s your fabric, the availability of fabrics and trims, which I would call your raw materials”. Manufacturer 2 goes on to mention the problem of fabric several times in the interview and he maintains that it impacts South African manufacturers’ ability to achieve quick turnarounds. Manufacturer 1 responds to this problem by trying to source predominantly from large wholesalers, “the big guys”, since “they’ve always got stock”. Manufacturer 2 tries to hold customers accountable for the stock that they keep. Manufacturer 3 responds to the problem by only dealing with large manufacturers and importers, “We don’t deal in the lower end of the market, we don’t deal with the wholesalers”, and directly importing fabrics so that “we’re in control”. Although the last solution seems the most
effective in guaranteeing a supply, it also leads to capital being tied up for long periods at a time. According to Bruce et al. (2004:165) clothing manufacturers have extremely low profit margins so holding even small amounts of stock is not a viable option.

4.4.1.3. Theme: Importance of consistency

According to Roh et al. (2014:207) (Section 2.5.3), traditional supply chain strategies that focus on cost-efficiencies and stability are not suitable to a contemporary customer-centric, or design-pull, global business environment. Instead, they advocate for a responsive supply chain strategy that allows for adaptability to rapidly evolving consumer demands, whilst at the same time reducing waste throughout the chain (Roh et al., 2014:208) (Section 2.5.3). When asked what their key criteria are for choosing one supplier over another, the respondents unanimously chose stability. Manufacturer 1 states, “It’s more about consistency and reliability, especially with fabric”. Manufacturer 2 states, “Reliability, that’s usually the most important, consistency and reliability”. Manufacturer 3 states, “We pride ourselves on delivering on time, every time, in full so we deal with suppliers that can support us”. For all three respondents, price was the least important factor. Manufacturer 1 states, “Price is the absolute last thing to worry about”. Manufacturer 2 concurs, “I’d rather pay more for a better quality fabric or trim or whatever you want to call it than go for a cheaper one and have problems”. Manufacturer 3 states, “Last on the list is probably the price […] to quibble over a cent or two on a button versus my delivery on time…there really is no argument”. Due to the small pool of suppliers, none of the three respondents even have the luxury of selecting suppliers according to price. It follows that, only once the
respondents are able to also consider price as a factor, can the concepts of responsiveness and adaptability even be entertained.

4.4.2. Subconcept: Stable supplier relationships

According to Roh et al. (2014:208) the MC manufacturer must implement socio-relational integration with its strategic suppliers. Manufacturers 2 and 3 placed great value on their supplier relationships. Manufacturer 2 states, “If you’ve got a problem and you need a quicker delivery, you need a favour or whatever the case may be…believe you me they’ll bend over backwards to help you out because you are decent to them” and, “You treat them as an equal, you don’t treat them as just another supplier”. Manufacturer 2 also believes that all suppliers should be kept happy due to the size of the industry: “Generally what we do is we buy from both because something can happen to either one of them and you sit with the problem […] so we divide them up and we keep them happy”. Manufacturer 3 states, “We don’t really have the view of picking one supplier, for us it is building a relationship with our supplier” and, “whether it is a product being made out or whether it’s fabric coming in, it’s all about relationships”. Although Manufacturer 1 does not seem to place as much value on supplier relationships, this may be due to the fact that he mostly purchases from wholesalers, rather than placing special orders. He does however state, “this industry can be very cut-throat […] one thing I’ve learnt is loyalty pays off”.

4.4.2.1. Theme: Communication

Manufacturer 1 seems to communicate with suppliers on an ad-hoc basis, “with suppliers it’s difficult, it’s sort of a supply and demand theory”. This is most likely due
to the fact that Manufacturer 1 mostly works with wholesalers. Manufacturer 2 encourages suppliers to “come and see us, discuss, sit down, bring new products” and “our suppliers used to come in at least once a week”. Manufacturer 2 believes that this is “important because you get to know your supplier”. Manufacturer 3 states that her company communicates with suppliers “probably on a daily basis”. Although Manufacturers 2 and 3 underscore the theory that states that constant flows of updated information about market dynamics and demand patterns are necessary for the MC supply chain, the idea of “open communication channels” is less prevalent (Probst et al., 2013:2,15; Roh et al., 2014:198) (Section 2.5.3.1). None of the respondents, for example, had their suppliers linked to their systems, as suggested by Roh et al. (2014:208) and Pan (2012:229). Although there is the possibility that Manufacturer 3’s ERP system may allow for this in the future, it is equally plausible that the small supply pool does not warrant the complexities of linking Manufacturers 2 and 3’s suppliers to their systems. For these reasons, the focus for the manufacturers seemed to be centred on communication for the sake of relationship-building and information sharing, rather than just information sharing.

4.4.2.2. Theme: Collaboration

Mikkola & Skjøtt-Larsen (2004:353), Pan (2012:230) and Xiaosong et al. (2011:1029) (Section 2.5.3.2) all recommend collaborating and making joint decisions with supply chain partners at the planning phase. (Min et al., 2005:248) (Section 2.5.3.2) suggest/s the following tools for alignment: joint performance measures, joint performance monitoring and collaborative forecasting. While Manufacturers 2 and 3 performance-managed their suppliers, the measures used are not necessarily shared. Manufacturer 3 states, “there is often suppliers that are called in when we’re
not happy” and “I have to give them the opportunity to understand what we require”. While performance measures are communicated to the suppliers, there is no evidence that these performance measures are in fact shared or that suppliers performance monitor the respondents in return. There is also no evidence of collaborative forecasting. Forecasts are done a maximum of six months ahead of time and it would seem as if these are based on the presence of actual orders. Manufacturer 1 states, “It’s difficult to plan […] our planning goes as far as to plan for production in the next four-six weeks” and “on the big orders you go up to three-four-five months but then you’re talking about fabric arriving, coming in, what orders to cut, how many orders you’re doing a week, how many weeks it’s going to take you to produce the order”. When asked how far in advance Manufacturer 2 starts the ordering process he responds, “Let’s put it this way, our turnaround would be eight to ten weeks but your fabric has to be ordered minimum 12 weeks in advance so, if you want to really look at it you’ve got to have a two month cycle, especially if your fabric is imported”. Manufacturer 3 has slightly longer forecasts: “we tell them over the next three or six months this is the forecast so prepare yourselves”. Manufacturer 3 seems to have the most collaborative supplier relationships, which may be explained by the calibre of suppliers that her company uses: “our men’s suits, our shirting fabric is into a Woolies supply chain […] we don’t deal in the lower end of the market, we don’t deal with the wholesalers”.

To summarise the concept of a stable supply base (Section 4.4), Labarthe et al. (2006:398) and Yi et al. (2011:272) (Section 2.5.3) write that, as more participants become involved in the supply chain, the relationships among them become increasingly complicated. In a sense, the three respondents’ supply ‘chains’ are quite the opposite: there are too few participants and the relationships with them are
relatively uncomplicated. This phenomenon necessitates a re-evaluation of the sensitising concept and its sub-concepts that was identified in the literature review in Chapter 2 (Section 2.5) and in Chapter 3 (Section 3.2.3). Rather than focussing on the integration and responsiveness of the supply chain, the supply chain should be considered in its entirety: both the presence of adequate supply and the relationships between the manufacturer and its suppliers need to be looked at. The presence of adequate supply proved to be a great stumbling block for all three respondents. Manufacturer 3 seems to have been most successful in overcoming these difficulties by choosing to work with better suppliers and keeping stocks of fabric. It is worth noting, however, that Manufacturer 3 is part of a larger company than the other two respondents and is therefore presumably able to afford the luxury of working with better suppliers and holding fabric stocks.

The fact that all three respondents valued consistency in supply over all other factors in supplier selection points to the importance of first determining whether adequate supply exists in the supply chain before considering other supply chain factors. Information sharing was considered under the theme of communication and collaborative planning was more generally considered under the theme of collaboration. These both fell into the sub-concept of supplier relationships. All three respondents valued supplier relationships, however, Manufacturers 2 and 3 were most committed to these relationships, regularly communicating with their suppliers. The fact that Manufacturer 1 seemingly places less value on supplier relationships and communication is explained by his reliance on wholesalers. None of the respondents seemed to collaborate with their suppliers to the degree that the literature seemed to suggest. However, Manufacturer 3 seems to collaborate with her
suppliers most. Labarthe et al. (2006:400) (Section 2.5.3.3) suggest that manufacturers should model and simulate their supply chain prior to the implementation of MC. Again, this sensitising sub-concept proved irrelevant in the face of the simplicity of respondents’ supply base. A summary of the themes, sub-concept and the concept of a stable supply base is illustrated in Figure 4.3. Figure 4.3 also illustrates the difference between the initial sensitising concepts and sub-concepts and those that emerged from the interview data.

Figure 4.3: Stable supply base as a concept based with the themes and sub-concepts that emerged to support it (Author’s own compilation, 2015)
4.5. Additional findings

According to Bowen (2006:3) it is important that researchers using sensitising concepts (Section 3.2.3) remain open to other important aspects that might emerge from the data. Although these additional findings are not central to the main research question, they are of general interest.

4.5.1. Additional finding: Good management

All of the respondents cited the importance of good management in achieving production efficiencies. Manufacturer 1 states, “It’s about time management and organisational skills”. Manufacturer 2 states, “Unless you’ve got somebody driving the whole system and driving everything, if you don’t have that person it’s all going to fall flat”. Manufacturer 3 states, “We have a very strong management team” and that, despite flexibility costing money, “we’ve got the management strength”. Manufacturer 3 also referred to management practices that are, in themselves, flexible:

“As a company, we make decisions and we make it happen. If we realise it’s a mistake we admit it immediately and move on. That’s how we operate. There's no protocol to follow and process and whatever. We literally have an HOD [head of departments] meeting every Wednesday morning and we make decisions and implement. If that afternoon we find out it's the biggest mistake we could have done...no need to call a meeting and see the board, no”

It is worth noting that Manufacturer 3’s company has grown tremendously in the last decade or so: “When I joined the company 13 years ago we were thirty staff members, we had no computer, we had a typewriter so to grow to 600...". These findings are in keeping with Probst et al. (2012:2) who state that implementing MC “requires an enabling business environment that facilitates risk-taking and promotes entrepreneurship”. Since the business environment is beyond the scope of this minor dissertation, as per Section 1.8, this point falls under “other findings”.

93
4.5.2. Additional finding: Loss of skills in the industry

In the same way that a conducive company culture is essential to the implementation of MC, it was clear that the macro environment also plays an important role in the respondents’ manufacturing environments. This point was initially mentioned in reference to operator skills (Section 4.2.2) and technological literacy (Section 4.3.3). Further to this, Manufacturer 2 is especially concerned about the loss of skills in the industry:

So the skills are being lost in the industry through...a lot of BEE and things like that that are happening. And I think that it’s a tragedy, an absolute tragedy that we’re losing people that are so highly skilled. Especially in the clothing industry because it’s an industry that there hasn’t been a succession plan to it. [...] So what is going to happen? Everything is just going to implode. Unfortunately. And nobody is taking cognisance of it. It’s a huge, huge problem. You know, the sooner somebody wakes up or the government wakes up or whatever... People are...factories are going to close down because the older people like myself are just not there anymore. There's no succession plan.

In reference to him and similarly qualified industry experts Manufacturer 2 states, “We’re becoming extinct like the Dodo, it’s sad”. As per Section 4.2.2.3, part of the problem is that young people are not attracted to the industry. His statement echoes the findings from a study undertaken ten years ago by Morris, Barnes and Esselaar (2005:19), who stated that skills development is a problem for the South African industry and that it is partly due to bright youngsters and recent graduates viewing it as a “sunset” industry. It is also interesting to note that Manufacturer 1 largely employs Bangladeshis in his factory: “A lot of our staff...most of our staff...are Bangladeshis”. Although, this may also be due to the fact that he does not have his own training facilities (Section 4.5.1.2) and expects to hire already qualified machinists (Section 4.2.2.3).
4.5.3. Additional finding: Concerns about other aspects of MC

The respondents were all asked about the feasibility of MC as a manufacturing paradigm for the South African clothing industry. Only Manufacturers 1 and 3 somewhat understood what the meaning MC, while Manufacturer 2 understood it to be quick response. This is not at all a reflection on their capabilities, as the clothing industry and literature tend to interpret terms in different ways (Kincade et al., 2013:2). Both Manufacturers 1 and 3 had concerns about the retailing of mass customised goods. Manufacturer 1 actually offered a form of MC on his website:

“We created a website where you could create your own garment. So basically what the website had is you could pick a garment, just a shell, ok. You could click on an inset and change the colour, pick a colour of the inset that you wanted. You could basically colour in your own garment but based on a style that was available on the website. We loaded I don't know 3,000 styles on there. 250 golf shirts, 150 different pairs of pants, tracksuits, jackets, windbreakers, drimacs, we loaded all of those block styles. Front and back, you know. You can see the outlines and you colour it in, you can choose what to do”.

Following the submission of the drawing by the customer, the factory would send a professional drawing back to the client, “with all the little bits of bobs and bells and whistles and draw-cords and tassels“. According to Manufacturer 1, the tool was used about 20 times in five years, despite being advertised to the 2,500 promotional agencies on his books. Although Manufacturer 1 is not completely certain why it failed, he partly attributes it to the clients’ need to have their imagined design drawn for them and with them. This statement is echoed by Bellemare et al. (2014:95), who state that consumers’ lack of experience and knowledge may limit their ability to determine what it is that they want in terms of mass customisation. Manufacturer 3 is also concerned about maintaining relationships over an electronic interface: “You know, I think you lose...in the market that we service...you lose the personal interaction with the customer and it’s quite important for the relationship”. It is worth
noting, however, that Manufacturer 3 is generally not enthusiastic about online shopping for clothing:

“Garments are about touch-and-feel so even online shopping I feel slightly uncomfortable with. It might look beautiful but you want to touch and feel.”

Both Manufacturers 1 and 3 also had concerns over the technical difficulties that are associated with MC. Manufacturer 1 states, “You can’t just have anybody put what they like on the web because not everything you put to paper works on a garment”.

As an example Manufacturer 1 states:

“You can’t end a seam in the middle of a garment. It doesn’t work. It’s got to go from one end to the other end. Or that inset, you can’t make an inset like this because it’s going to pucker. Won’t work on that fabric. It’ll work on a cotton but it won’t work on a polyester. Because poly’s got too much give in it so when you’re showing it it’s going to get puckered.”

Manufacturer 3 states:

“From a technical perspective, I mean I’m not the expert, but we’ve often had, ‘Here’s my measurement, make a garment’ […] I have never seen you so I’m assuming… I have to make the garment to fit the widest part of your body, technically. You get the garment and it looks like hell because I can look at you and say you’re actually a size 10 or you’re a 14 or whatever but if I’ve never seen you I’m purely working on measurements on paper. In my experience, we’ve had very little success with that.”

Furthermore, Manufacturer 3 cites logistical issues with this business model:

“The next problem is in your dispatch to make sure you get the garment with the collar and the buttons that you selected, not the person that wanted the stripes the other way around with the purple buttons. We do what we refer to as “specials” for customers […] but, sure as hell, the wrong person…the one with the hunchback will get the one sleeve garment and, now to get it back and exchange… So those are logistical issues that are more of a potential problem.”

Further to these concerns, Manufacturers 1 and 3 both asserted that MC is not problematic in terms of manufacturing. When asked whether he thinks that the manufacturing of mass customised goods poses a problem Manufacturer 1 responds:
“Not really, because you know you’ve picked your own style, you’ve chosen your style, you know what style you want, you’ve chosen your colours...it’s just a case of choosing what fabric you want and your trims. Basically you just decide what fabric you want.”

Manufacturer 2 states:

“On an operational challenge, it's what we do. All you have is you have a sample factory. It's really making one, one, ones of everything. You would need massive pattern capacities and expertise but I think in our factory setup the production side of it is the least of your problems. So, the manufacturing process is not the challenge. I think it’s ahead of that and the logistics beyond that.”

4.6. Summary of Chapter 4

The findings suggest that Manufacturer 1 does not have the competencies needed to mass customise. Although there is evidence of some flexibility in Manufacturer 1’s manufacturing, he aligns much more with lean manufacturing. Manufacturer 1’s lean philosophy and business structure has also resulted in a reluctance to invest in technologies that would enable MC. Finally, the fact that Manufacturer 1 sources from wholesalers affects the suitability of his supply base to MC manufacturing. His reluctance to hold stock and the relative inconsistency of using wholesalers affects his supply adequacy. Additionally his use of wholesalers affects his ability to have the kinds of relationships with his suppliers that manufacturing for MC would require. Importantly, this does not reflect poorly on Manufacturer 1’s competency as a clothing manufacturer, only that his current operations are not suited to MC.

By contrast, the findings suggest that Manufacturers 2 and 3 both have the first two competencies required to mass customise: the ability to undertake flexible manufacturing and the presence of supportive technologies. Firstly, both respondents already manufacture for MC, albeit for corporate customers. Secondly, both Manufacturers 2 and 3 seem to have the technologies necessary for MC in place.
Furthermore, both the respondents have successfully integrated this technology. Although both are somewhat affected by the lack of technological skills in the industry, they are still managing to run their technology and, in Manufacturer 2’s case, to achieve 80% automation in his manufacturing. The findings suggest that Manufacturer 3 is the most resilient to supply chain challenges, the third competency. Manufacturer 3’s company seems to manage the adequacy of its supply by directly importing and holding fabric stocks, and its supplier relationships by choosing to work with better calibre suppliers. All three respondents are, however, at least somewhat affected by the paucity of local suppliers and the resultant effects that this has on their supply base. The assertion by two of the manufacturers that they do not perceive great difficulty in the implementation of MC manufacturing is also a significant finding. A summary of all of the emergent themes, sub-concepts and concepts to emerge from the findings is shown in Figure 4.4 (a larger version is available in Appendix 6). These emergent concepts are shown in relation to the sensitising concepts and sub-concepts that were identified in Section 2.5 and 3.2.3. This is in keeping with Padgett (2004:301) (Section 3.2.3) who states that emergent concepts may supplement or displace sensitising concepts altogether.
Figure 4.4: Summary of the themes, sub-concepts and concepts identified in the findings in relation to the sensitising concepts identified in the literature (Author’s own compilation, 2015).

One of the other findings that emerged from the interviews is the importance of good management in a flexible manufacturing environment. It is interesting to note that Manufacturer 3, who appears to be the most capable of MC manufacturing, regularly cited the importance of this factor. The loss of skills in the industry affects all three manufacturers. If Manufacturer 2 is correct about the increasing loss of skills in the industry, this finding raises some concern. The fact that Manufacturer 1 is hiring Bangladeshis over South Africans, in part due to the lack of local skills, is troubling. Finally, both Manufacturer 1 and 3 raised concerns over the feasibility of MC in terms of its retailing, technical difficulties and logistical issues. These concerns must be considered against a broader background. For example, it may be that Manufacturer 1’s web interface was not user friendly. Manufacturer 3’s concerns about an
electronic interface need to be viewed against her personal reluctance to purchase clothing online. Finally, both respondents’ technical concerns and Manufacturer 3’s logistical concerns are very probably solved by algorithms and automated systems. However, their concerns point to a need to study each of these areas further. All of these additional findings are considered further in Chapter 5, which is a conclusion to this study with recommendations.
CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

This chapter focuses on the degree to which the research objectives have been met by answering the research questions, and provides study conclusions and recommendations for further research based on these conclusions.

5.2. Research questions

This conclusion begins by answering the research sub-questions, followed by the main research question.

Research question 1 is: What are the main competencies that South African clothing manufacturers need to have in place prior to engaging in MC? This research question was initially answered in Chapter 2, where global competencies were identified from the literature. In this initial round of research, the three main competencies that were identified as being necessary for the manufacture of mass customised clothing to take place were the ability to undertake flexible manufacturing, the presence of supportive technologies and the presence of an integrated and responsive supply chain. Further to these main competencies, sub-competencies that enable these main competencies were identified from the literature. The ability to undertake flexible manufacturing requires the presence of flexibility and the presence of adaptive human resources. The presence of supportive technologies requires investments in supportive technologies, the integration of these technologies and the presence of technological literacy in the users of the technologies. An integrated and responsive supply chain requires collaborative
planning and information sharing between its partners and the possibility of modelling or simulating the supply chain prior to implementation. The main competencies and sub-competencies identified in the literature as being necessary for the implementation of MC in clothing manufacturing were collated into a conceptual framework, see Figure 5.1.

![Figure 5.1: Conceptual framework of the competencies needed for the successful implementation of MC, according to the literature (Author's own compilation, 2015).](image)

These identified competencies and their sub-competencies were then updated with the findings from Chapter 4. In respect of the first competency, all three manufacturers indicated that the productivity of their factory staff is a consideration when undertaking flexible manufacturing. Furthermore, two of the manufacturers indicated that this is an important consideration for South African clothing
manufacturers. The *adaptive human resources* sub-competency was thus renamed to *adaptive and effective human resources*. The third competency was titled *integrated and responsive supply chain*. It was evident from the findings that South African clothing manufacturers are not yet in a position to consider the integration and responsiveness of their supply chain. Due to a very small pool of suppliers and the importation of a good deal of their raw materials, the manufacturers were rather most concerned with creating a stable and consistent supply base. The fact that price was the last consideration for all three manufacturers when selecting suppliers points to a gap between South African clothing manufacturers’ reality in relation to international supply chain literature. In fact, all three manufacturers questioned the very concept of a supply chain, explaining that they often did not have a choice as to who supplied them. For both of these reasons, the competency was simply renamed to *stable supply base*. The sub-competencies of *information sharing* and *collaborative planning* were found to be less important than initially conceived and were thus reduced to become themes under the new sub-competency of stable supplier relationships. The need for suppliers to offer consistent supply was added as a sub-competency titled *stable supply*. The sub-competence *possibility of modelling or simulating* the supply chain was also removed due to its irrelevance in the face of the dearth of suppliers. Since one of the manufacturers had managed to successfully manufacture mass customised clothing by stabilising her supply base, this updated competency maintains its relevance to the successful implementation of MC in South Africa. A revised conceptual framework of the competencies needed for the successful implementation of MC in South Africa as per the findings has thus been created, see Figure 5.2.
Research question 2 is: How do three South African clothing manufacturers measure up against the identified required competencies for the implementation of MC? This research question was answered in Chapter 4. Out of the three manufacturers interviewed, only one manufacturer seemed to measure up against all the identified required competencies for the implementation of MC. Another manufacturer very-almost measured up, whilst the third manufacturer only measured up to a few sub-competencies.

Research question 3 is: In instances where the required competencies for MC are not present in the three clothing manufacturers, why is this the case? This
research question was also answered in Chapter 4. The manufacturer that only measured up to a few sub-competencies did so because he chooses to follow lean practices, both in his manufacturing and in the way that his company is structured. As a result, he does not take on true custom work and aligns more to mass production practices, such as exclusively using the bundle system, which prevent the achievement of full flexibility in his production. Also as a result, he has not invested in the technologies that support MC. Finally, the lean practices of the manufacturer have lead him to not invest in fabric stocks and to rely on wholesalers, affecting the stability of his supplies and the possibility of having supply relationships that are conducive to MC. The manufacturer that very-almost measures up to all the competencies is also somewhat negatively affected by inadequate supply and hampered supplier relationships, despite only partially relying on wholesalers. In all instances, the small pool of suppliers that the manufacturers have to choose from affects them negatively, however the manufacturer with the greatest competencies has been able to mitigate these supply problems best.

The main research question is: How suitable is MC for South African clothing manufacturers? The sub-questions above helped to answer the main research question. Given that the findings indicated that one manufacturer was potentially suited to MC and that a second manufacturer was very-almost suited to MC, at first glance it appears that South African clothing manufacturers are in fact suited to manufacturing MC. However, in the instance of the manufacturer that was suited to MC, it came at the cost of having to directly import and hold stocks of fabric in order to enable the fast turnarounds required of MC. The manufacturer that very-almost had the competencies necessary for MC was impacted by his reluctance to hold significant amounts of fabric stocks on his own account. Since fabric is the largest
expense in a garment, holding fabric stocks represents a significant tying up of capital and it seems significant that the manufacturer that directly imported and held these stocks is also the largest of the three manufacturers. To the extent of this exploration it would seem that MC is suitable to large South African clothing manufacturers that have the financial means to import and hold fabric. However, the presence of not only the competencies needed for MC manufacturing but of the key features of MC, such as postponement and the use of product families, in two of the manufacturers is very positive.

5.3. Limitations of this study

Most importantly, this study is explorative and can therefore not be generalized to all clothing manufacturers in South Africa. The findings only indicate that at least one manufacturer in South Africa appears to be capable of manufacturing for MC, while a second appears very-almost capable. The fact that none of the manufacturers are based in Durban or Cape Town, but all of their head offices are based in Johannesburg, is very likely a bias, since clothing manufacturers and their suppliers are predominantly based in Cape Town and Durban in South Africa. This research is also undertaken from the field of general business management, rather than a specialist field. It is therefore possible that, with greater research focus a production management expert may uncover additional or contradictory manufacturing phenomena from what this study has found. The findings also rely on the information presented by respondents during in-depth interviews and these findings were not corroborated with actual observations of their factories or further interviews with other members of staff.
Whilst it is clear from the findings that good management plays a significant role in maintaining productivity together with flexibility, this study does not consider the role of good management or leadership as one of the competencies need for the effective implementation of MC in clothing manufacture. Effective management and leadership are needed in all organisations for the successful implementation of strategies (Beer & Eisenstat, 2000:29) and, since this competency is not specific to MC, it was disregarded. Since this study is only concerned with the manufacturing of mass customised clothing, the findings in no way suggest that the manufacturer most capable of MC manufacturing has superior clothing manufacturing capabilities to the other manufacturers. It may well be that the manufacturer least capable of mass customising has an optimal manufacturing system outside of a MC paradigm. The study also does not answer the questions of whether MC is a suitable retail strategy, whether it is financially feasible for the manufacturers to implement or whether it is logistically possible.

5.4. Recommendations for future research

The aim of this research is purely explorative. Since it would seem that no recent literature exists on MC in the South African clothing industry, this research is a starting point. The competencies that have been identified in the revised conceptual framework may serve as this starting point for further research into the suitability of MC for South African clothing manufacturers. As per the limitation of geography, it is recommended that this study, or one similar to it, is rolled out to more manufacturers in Cape Town and Durban. The literature seemed to indicate that the manufacturing of mass customised goods is the most challenging aspect of implementing a MC strategy. This research thus focussed on the manufacturing of mass customised
goods. However, as per the limitations, this does not answer the suitability of MC as a retail strategy, its financial feasibility for the manufacturers and whether it is logistically possible. All of these would need to be investigated prior to implementing a MC strategy. Although this study is only explorative and not generalizable, the fact that all three manufacturers cited the stability of their supply base as a key concern seems noteworthy. This finding is expected, considering the closure of the majority of South Africa’s textile mills (Xiaoyang, 2014:25). It may thus be worthwhile to study this factor in the context of the suitability of MC as a strategy more closely.

The finding that two manufacturers invested in technologies that support MC with such enthusiasm is somewhat surprising, as it contradicts both global research on MC manufacturers’ reluctance to improve systems (Bellemare et al. (2014:94) and research about South African manufacturers’ unwillingness to invest in generally supportive technologies (Morris & Barnes, 2014:13). This contradiction seems noteworthy and the reason that it exists may hold research value. The fact that two of the manufacturers have grown exponentially in the very period that clothing manufacturing data shows a decline (Natassa & Seekings, 2012:2) is of significant interest to future research. Understanding what these manufacturers did to buck the trend seems to be of relevance to the South African clothing industry.
5.5. Summary of Chapter 5

This chapter sought to answer the three research questions were each answered with reference to the conceptual framework that was used throughout this study. Secondly the limitations to the study were discussed. Some of these limitations led to recommendations for future study, which was the final section of this study.
REFERENCES


Walcher, D & Piller, F. *An international benchmark study on mass customization and personalization in consumer e-commerce*. Raleigh: Lulu.


APPENDIX 1: INTERVIEW GUIDE

Background: Demographics

1. How long have you worked in your company?
2. What is your role in the company?

Background: Existing knowledge of MC

3. Prior to this interview, had you ever heard of MC?
4. In your opinion, what are the stumbling blocks to implementing MC in your organisation?

Sensitising concept: Flexible manufacturing through modularity

Sensitising sub-concept: Presence of flexibility

5. What key considerations exist in the manufacture of corporate clothing that, in your opinion, do not exist in “normal” clothing production?
6. What do you understand by the term, “flexible manufacturing”?
7. If yes, have you ever had to implement a flexible manufacturing system in your company?
8. Have you ever heard of modular production?
9. If yes, have you ever had to implement a modular production system in your company?
10. Have you ever heard of lean or agile manufacturing?
11. If yes, have you ever had to implement lean or agile manufacturing in your company?
12. What variances in order quantities do your regularly experience?
13. What manufacturing methods do you use to cope with such variances?
14. What manufacturing system is predominantly used in your company?
15. How automated are your processes?

Sensitising sub-concept: Adaptive human resources

16. How often do you change your production flow or manufacturing setup?
17. Do you see value in regularly re-evaluating the production flow or manufacturing setup, or do you think it is best to maintain stability?
18. How much of an understanding of the manufacturing process does your manager have?
19. Do you make use of teams for the manufacture of goods in your company?
20. If so, can you describe how these work?
21. How do you measure quality in manufacturing?
22. How do you keep your workers motivated?
23. Would you say that your workers have good relationship skills?
24. Are your workers capable of operating several different machines?
25. Do you feel that your workers are adequately skilled?
26. What training do you provide for your workers?

**Sensitising concept: Supportive technologies**

**Sensitising sub-concept: Investment in supportive technologies**
27. Would you say that your company has the right manufacturing technology?
28. What technology does your company make use of?
29. Does your company use CAD software?

**Sensitising sub-concept: Integration**
30. How integrated is the company’s IT with its manufacturing systems?
31. If yes, is the CAD software integrated with the manufacturing systems?

**Sensitising sub-concept: Technological literacy**
32. Does your company have an IT technician or department?
33. Do you believe that manufacturing technologies improve processes?
34. How technologically literate are the operators?

**Sensitising concept: Integration and responsiveness of the supply chain**

**Sensitising sub-concept: Information sharing**
35. How do you communicate with your suppliers?
36. How often do you communicate with your suppliers?
37. Are your suppliers linked to your systems? If so, which?
38. Would you say that you openly share information with your suppliers?
39. How far in advance do you start the ordering process with your suppliers?
40. Do you the CEO and Executives communicate directly with suppliers?
41. How often are forecasts communicated to your suppliers?

**Sensitising sub-concept: Collaborative planning**
42. What are the main criteria for choosing a certain supplier over another?
43. Do you involve your suppliers when planning?
44. Do you collaborate with your suppliers on forecasts?
45. Does your company share performance measures and performance monitoring with your suppliers?

**Sensitising sub-concept: Modelling and simulation**
46. Have you ever modelled your supply chain?
47. Do you simulate your supply chain prior to instituting new projects?
APPENDIX 2: INTERVIEW TRANSCRIPTS

The interview transcripts were removed from the final copy, as these contain information that is sensitive and which may lead to the respondents being identified.
Figure 3.1: Conceptual framework with question numbers pertaining to each sensitising concept
APPENDIX 4: SAMPLE OF THE CODING TABLE

<table>
<thead>
<tr>
<th>Sub-concept: Presence of flexibility</th>
<th>Themes</th>
<th>Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order variances</td>
<td>&quot;It varies from 30 to 100 to 5,000 to 10,000. We do minimum orders of 30 and maximum orders of...20,000.&quot; (M1) &quot;We gear ourselves for anything at any given time. OK. That's how it works.&quot; (M1) &quot;it could be anything. It could be a school ordering 30 tracksuits, it could be a corporate only ordering 1,500 work shirts or it could be Legit ordering 10,000 garments for a line&quot; (M1) &quot;From one garment up to 1,000 garments&quot; (M2) &quot;roll-outs and fill-ins&quot; (M2) &quot;we've got the manufacturing facilities here, we can manufacture 50 size 28s or two size 28s&quot; (M3) Minimum order quantity: &quot;1&quot; (M3) &quot;And then there are the niceties of 700, 800, 5,000 of the same thing&quot; (M3)</td>
<td></td>
</tr>
<tr>
<td>Level of customisation</td>
<td>&quot;I walk away...I've already walked away. I make a spec shirt. Because you can't tell me that every person here goes to [a fashion retailer] and asks them to make a size this. Crap!&quot; (M1) &quot;I don't know but they had a team...a fitting team that used to go out and measure the people. You know, think about the cost involved. Now you've got to pay for a fitting team. You have to travel, send them up and down to every branch. Where does that cost come from?... You want lounge shirts I'll make you lounge shirts. Any colour you want. But I'm not going to make one at 38cm and one at 90cm. I make medium, larges, extra larges, etc. It's the same fit you'll get at [fashion retailers], any chain store.&quot; (M1) &quot;we have to charge the same price but we will charge a surcharge for specials &quot; (M2) it's fit-to-measure in certain instances so specials are a huge problem. You've got to have people that actually physically measure the clients, especially if it's a corporate house like Standard Bank, for instance. We have fitting ranges, which they will then try on but there are people that fall out of those fitting ranges.&quot; (M2) &quot;On the bigger customers, purely because of volume, it is eight to twelve weeks&quot; (M3) &quot;we've got a sample group of 600 people that we can fit garments on and look at what the fit is. So when we go into, what we call, our fit ranges we've already sorted out all those issues so what you're fitting is what you're going to get. We don't do tailoring and say, &quot;For you I'm going to take a bust dart in deeper&quot;. It's a generic fit but based on the huge amount of people that we've had the opportunity to fit.&quot; (M3) I mean I've just explained to you on the flexibility of changing the style, changing colour, prioritising different customers. It costs money, yes it does. But we've got the management strength and our setup is...I think it's suitable...(M3)</td>
<td></td>
</tr>
<tr>
<td>Simultaneous mass manufacturing</td>
<td>“You have to be flexible in your manufacturing in order to be able to cater for that.[variances]” (M1) “It could be a school ordering 30 tracksuits, it could be a corporate only ordering 1,500 work shirts or it could be [a fashion retailer] ordering 10,000 garments for a line, you know. We gear ourselves for anything at any given time. OK. That's how it works.&quot; (M1) “we set it up to run [a fashion chain] stuff one whole side of the factory because we had...I think it totalled out about 180,000 garments for a period of four months...five months...six months.&quot; (M1) “When they go into production they'll start with whatever’s first in the bundle – medium, large, smalls, extra large, size 36, whatever’s first. They’ll do one size first and then the next size.” (M1) “The only time we really change it is if we get huge orders for like, you know, for [a fashion retailer] or for [a fashion retailer] or one of those. They’ll give you an order and it’s 150,000 units, which has got to come out 5,000 units a week. So you’ll set up four lines, five lines, because you’ve got four months worth of production. So it makes sense. And it’s all ladies fashionwear. When you manufacture it, all the lines have the same machinery.&quot; (M1) “The second one is what we call a bundle system works quite well because you’ve got bigger runs, bigger cuts, whatever and the operators get used to working in bundles. Stock then is moved through the line in bundles.&quot; (M2) “one of the big challenges in the production of corporate clothing is that you’re doing small runs” (M2) &quot;custom make those garments and the runs are small&quot; (M2) “the biggest thing is the small runs and, obviously, the small amounts of fabric that...&quot; (M2)</td>
<td></td>
</tr>
</tbody>
</table>
you're going to need for those." (M2)
"so the smaller runs, like I said, a big problem but there are ways and means of getting around them." (M2)
"the big roll-out is not a problem to handle because it's mass production." (M2)
"And then there are the niceties of 700, 800, 5,000 of the same thing." (M3)
"It’s a monster factory to feed so there are times that we do the bulk because we have the capacity." (M3)
“Our contracts are split sometimes over a six, twelve month period so we’ve got the peaks and the valleys and we’ve got to balance our production. So, in the quieter times we bring back some of the hundreds, seven hundreds and thousands to do internally and that just boosts our production output significantly.” (M3)
“So that’s also broken into categories with the bundling process. So, one set of bundlers will look after that line, after that line, after that line.” (M3)

Style variances

“They can’t just be singularly minded. And that’s how you manage in this industry because if you only make lounge shirts, by crikey, you’ll go out of business sooner or later because you might make loads of lounge shirts now but six months later when winter comes and no one wants lounge shirts then what do you do? Shut down your factory? That’s how it works.” (M1)
“we make everything from lounge shirts, jackets, safety wear, trousers, blouses…I don’t know…shorts, T-shirts, golf shirts, …name it…chinos, pretty much anything you can think of.” (M1)
“So we can have a production line running on trousers now and we can change that line to make shirts or jacket or whatever the case may be. So the flexibility has to be there.” (M2)
“We don’t do menswear, we don’t do jerseys, we don’t do shoes” (M3)

Presence of lean manufacturing

“I’m a factory. I make clothing. It’s all I do.” (M1)
“A wise man once said if you make bottles, don’t make the labels.” (M1)
“We’ve got part-time staff and we’ve got permanent staff. Like I said, the problem with the industry is that you can have nothing today and everything tomorrow…” (M1)
“My business is: I don’t own the factory. My business partner owns the factory. I run the operations, I bring in the orders, he runs the factory. I make sure they’ve got work.” (M1)
“Well, they come through me. If they come to the factory he sends them to me and I do all the work. He plans the production lines, I just make sure he’s got the work. Make sure he’s got the fabric, make sure he’s got the patterns, markers…I make sure he’s got everything. And he makes sure it all comes out the other side perfect.” (M1)
“So fabric comes in and we just cut and manufacture and we supply per week a minimum of what we can. So the minimum of what they expect and possibly more, if possible. It’s production – the lines just push out stuff, push out stuff.” (M1)
“I can’t afford to keep a permanent pattern maker on tap. It doesn’t work that way.” (M1)
“we also make use of a lot of CMTs so we manufacture about 50% of our garments and the others are made out. We don’t do menswear, we don’t do jerseys, we don’t do shoes but we supply that as part of the uniform so we’ll outsource those kind of items.” (M3)

Presence of agile manufacturing

“You might have to jiggle. Stop one line from doing something, move it back to somebody else. You might be running three, you might be running five lines of garments and reduce it to four to put another order through or reduce it to three to put another two orders through, whatever the case is.” (M1)
“So now we’re getting three or four other orders, smaller orders. We’ll then retract from one of the lines or two of the lines, whatever’s necessary, and slot in the new orders. And obviously once they’re complete we’ll spread the work again.” (M1)
“So we can have a production line running on trousers now and we can change that line to make shirts or jacket or whatever the case may be. So the flexibility has to be there.” (M2)
“we can either say we want to have all the navy pairs of pants going down the line so that you don’t have everybody changing thread or we can say, you know what, let’s do all the green blouses and then all the red blouses and then the purple blouses”. (M3)
“Yip. I think [a fashion retailer] is one of the biggest…um I think that they actually started before [a fashion retailer]…speed-to-market and that type of thing. And they tried to adopt what Hugo Boss did in Turkey is trying…or has achieved to do but there’s quite a different context to where we are in South Africa and where they are because, if you’re a one-stop entity where you are manufacturing your fabrics, everything happens in sequence. You’re in charge from beginning to the end. It’s a lot easier than us relying on fabrics coming from the East. We do not have the local mills that can manufacture the fabrics so our turnarounds, I mean, are much longer and speed-to-market is fine if the fabrics and everything are here in stack. We were approached by [a fashion retailer] as one of the selected factories with which they wanted to try the speed-to-market concept but up to now it hasn’t grown because I think they’re still battling with their own factory in Cape Town to get that off the ground. And they’re having a huge problem with that as well.” (M2)

“Presence of quick response

“It can range from one…we’ve actually just finished our middle-of-the-month delivery. We’ve got two cut-offs so the 16th is…if we deliver on the 16th we’re even late and after allocation, we’re missing a size 36 or 38, they packed a 38 instead of a 36. That garment’s manufactured and in an hour or two’s time the dispatch will have that garment so that that parcel can go out.” (M3)

“You know, if you’re ordering a pizza and it says 45 minutes you’ll say, “Thank you very much I’ll try the next guy”. 30 minutes. And that is the customer’s expectation. Not necessarily what you can offer them, how quickly you can get it to them. So, I think Zara’s followed that kind of business model: quicker and quicker and quicker turnaround. Being in one building, one factory, we can chop and change. We can prioritise customers. We do our own internal embroideries so…under one roof, easy to…easier to manage and control – especially the smaller quantities.” (M3)

“Average line is about 8-12 machines, depending on what you’re going to use.” (M1)

“We tried it to a smaller extent We put people into small modules and said, “Right, this is what you do, this is what you do” but because of our small runs we implemented it more in the Johannesburg area in our sample department.” (M2)

“To an extent it works but you need to have slightly bigger runs for that to work. If you’re going to do it on small runs in ones and twos and threes you don’t get the momentum of it. You need larger production runs. I would say that would be more applicable to the fashion industry where they have the longer runs, where they can sit at the modules, they know they’re doing 5,000 units through that module and that’s pretty difficult from the corporate side. You can’t really implement it here.” (M2)

“The only modules that we do implement are prep sets or pre-prep sets where all the standard operations are basically done in that area. So it comes from the cutting room into the prep area, they do all the standard operations and then it can be fed onto the different production lines. For instance, jet pockets, bolt pockets, things that are standard on every garment, shirt pockets if it’s a blouse. If there’s a pocket to be set it’ll be set before it goes onto the line so that the line basically becomes more an assembly than what it is a preparation.” (M2)

“That’s why [modular production] we’re so successful in producing the smaller runs and also having the style changes not affecting us that much” (M2)

“We’ve got the management strength and our setup is…I think it’s suitable…purely because we don’t run the production lines that consist of 100 people. It’s smaller little teams of people that can…” (M3)

“Presence of modular production

“about 20, 25 people in a team. And within that team it is broken into preparation, and then smaller little teams with a team leader. You do all the green, you do all the red, you do all the blues, you do the pants. So these little cells are functioning independently. It just gives us flexibility. And, again, being in-house is much easier.” (M3)

“Correct. It’s little departments within the bigger picture. In the end, they are giving me 40, 45 blouses and hour but it comes from little departments within the blouse line. Um…it’s all very much dependant on product. If I’m going to do 700 of the same thing I might run it down the 25 people on the line. Where if I have 25 of the same style but split into different colours” (M3)
APPENDIX 5: BLANK INFORMED CONSENT AGREEMENT

This agreement serves to confirm that the research participant mentioned below gave his/her consent to participate in a qualitative study. The research participant agrees to provide the researcher with his/her experiences and views of the area of research to the best of his/her ability.

The undersigned participant understands the purpose and nature of this study and understands that his/her participation is voluntary and that s/he may stop the interview at any time. The participant further grants permission for the data collected to be used in fulfilment of the requirements for Masters of Commerce qualification to be submitted to the Faculty of Management at the University of Johannesburg and any future publications.

The data collected will be used for research purposes only. The undersigned participant understands that in terms of the ideals of the study’s methodology that the researcher may be obliged to make use of verbatim statements from the transcribed /recorded interviews. The participant grants permission for the audio and/video recording and that the researcher may make notes of her/his views and experiences. The participant undertakes to give a true representation of her/his perspective and her/his experiences.

I,_________________, the undersigned participant, at the beginning of the research project agreed to meet at mutually agreeable time/s and duration(s) or other means of communication, e.g. by e-mail, as reasonably necessary to enable the researcher, Marie Aoun, to gain a thorough understanding of my experiences and views of the phenomenon researched. I further acknowledge that I received a copy of this agreement and know that I may contact either the researcher or the supervisor if I have any queries whatsoever. I further acknowledge that I am satisfied that my personal information and representation contained in the dissertation is accurate and I give permission for the researcher to publish said information as part of her dissertation.

Signature of research participant:
Title, initial & surname:
Telephone: E-mail:
Date: Place:
APPENDIX 6: CONCEPTUAL FRAMEWORK WITH EMERGED THEMES

Figure 4.4: Summary of the themes, sub-concepts and concepts identified in the findings in relation to the sensitising concepts identified in the literature.