THE INFLUENCE OF PRODUCTION PLANNING ON BUSINESS PERFORMANCE AS A RISK MANAGEMENT TECHNIQUE IN THE MANUFACTURING INDUSTRY

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DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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ABSTRACT

Production planning in the manufacturing industry has previously been viewed as a less strategic function for achieving businesses' bottom-line goals. Many companies in the manufacturing industry focus more on strategic sourcing and cost saving initiatives for financial profits and often neglect the operational planning initiatives.

The purpose of this study was to examine the influence of production planning on business performance as a risk management technique. A quantitative approach was adopted for the study and a questionnaire was distributed physically and electronically to production managers, operation managers, supply chain managers and general managers; 306 respondents participated. The data obtained were analysed by means of the Statistical Packages for the Social Sciences (SSPS). Model fit and hypotheses between the relationships identified in the study were tested through the Smart PLS 3 software. Business performance was evaluated through four indicators, namely production planning, production scheduling, lead time delivery and first to market.

The results of the study show that production planning has a positive impact on the production scheduling function for lean production cost saving initiatives. The study also found that production planning positively influences lead time delivery and first to market because it manages the flow of material, production and delivery to the end user. Production scheduling and first to market proved to have very significant and positive relationships with business performance. These constructs have proved to deliver a competitive advantage and also improved customer satisfaction. The findings of this study present general key strategies to improve operational efficiencies and this study can contribute to increasing the literature in lean manufacturing and production excellence.

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CHAPTER 1

INTRODUCTION AND BACKGROUND OF THE STUDY

1.1 INTRODUCTION

Production planning has existed in the South African manufacturing industry for years but has failed to deliver the promised accelerated development of the economy. In the wake of 2008, the world experienced a depression that led to a global economic meltdown. Chollet and Sabatiera (2017:523) state that the European, American and Asian states did not just relax and watch the meltdown wreck the economy. More so, even in West Africa, a country like Ghana with its very limited resources did not relax in the face of the meltdown. Every little effort put forward by these countries to revamp their manufacturing sectors yielded fantastic results, either by the public or private sectors (Umoh, Wokocha & Amah 2013:1).

The reverse is the case in South Africa, where a huge amount of the people’s resources have been pumped into the manufacturing sector and no visible result is recorded but instead, the sector is seriously declining (Trading Economics 2017:2). Manufacturing production in South Africa shrank with 1.4 percent year-on-year in July of 2017, following a downwardly revised 2.2 % fall in June and worse than market expectations of a 0.35 % drop (Trading Economics 2017:2). The largest downward contributions came from petroleum, chemical products, rubber and plastic products, motor vehicles, parts and accessories and other transport equipment, wood products, paper, publishing and printing (Statistics South Africa 2018:1**).** However, Brand South Africa Reporter (2017:4) indicates that South Africa has developed an established, diversified manufacturing base that has shown its resilience and potential to compete in the global economy.

Every manufacturing activity requires resource input in terms of labour , materials, money and machines (Chollet *et al*, 2017:524); while Rao, Xanthopoulos and Zheng (2020:95) indicate that production planning is geared to meet the continuous stream of customers' orders. It follows therefore that maximum effectiveness should be implemented in such a way that customers’ demands are satisfied, but at the same time production activities are carried on in an economic manner (Chollet *et al*, 2017:524). The process of developing this kind of relationship between market demands and production capability is the function of production planning (PP). This has been described as the predetermination of manufacturing requirements of such things as available basic materials, detailed equipment, production runs, order priority, money, man and production processes within the scope of the enterprise for efficient production of goods to match its sale requirements (Umoh, Wokocha & Amah 2013:1). Manufacturing is one of the core sectors which injects a large sum of revenue into the country. Based on Zeng, Xie and Tam's (2010:181) observation, production planning assists in managing these companies which address the question of how to transform raw materials into finished goods to meet demand on time while avoiding high inventory costs (Seyedhosseini & Ghoreyshi 2014:1). Wu, Huatucc, Frizelle and Smart (2013:654) state that in the last two decades, manufacturing has encountered a great challenge with the ever increasing global competition and internal operations becoming more complex, taking into consideration aspects such as demand uncertainty, production costs, waste minimisation and machinery capacity. As a result, managers are required to be equipped with a broader understanding of what causes operation complexity and options available to counter this problem. Poor production planning, consequently, results in poor business performance within the manufacturing industry (Gomez, Lanzolla & Maicas 2016:270).

Production scheduling is a necessity for any manufacturing company and it should be carried out in such a way that demand and supply are balanced within the company (Bengtsson, Bredstrom, Flisberg & Ronnqvist 2013:848). In addition, Yang, Zhang, Fu and Liu (2017:680) suggest that a longer delivery lead time results in huge sales loss in many manufacturing companies and delivery dates are changed due to uncertain events on the factory floor that affect businesses performance.

Manufacturing firms are expected to adopt best production practices accommodating production scheduling, delivery lead time as well as first to market in the environment of demand uncertainty. Given that there is a gap between theory and practice, this study sought to investigate the extent to which production planning practices influence business performance as a risk reduction management technique in manufacturing firms and the relationship between production scheduling, delivery lead time, first to market and manufacturing performance.

1.2 PROBLEM STATEMENT

It is evident that for a manufacturing company to succeed, it is crucial to consider the factors that contribute positively to the performance of the business. Several factors have been identified and applied as determinants of firm performance. In particular, enhancement of the quality of the manufactured product, direct response to market demands, the minimal delay on the firm's behalf and, of course, the minimal production cost have been emphasised (Vranakis & Chatzoglou, 2013:339). The issues related to production planning have been neglected. Production planning is equally important as the core function in the manufacturing environment. Product scheduling, delivery lead time (just in time (JIT)) and first to market can be adopted as factors that manufacturing companies could consider in order to improve their business performance (Nguyen, Nguyen & Pham, 2020:69).

Although little research has been done to prove that production scheduling, delivery lead time and first to market influence the performance of a business, little has been done to demonstrate that production planning can be adopted by a manufacturing company as a strategic risk management technique to oversee operations and the advantages that come with planning. Little research has been done to prove that production planning can lead to reduced delivery time to customers, first to market for the organisation as well as the overall business performance.

Therefore, this study sought to fill this gap by investigating the influence of production planning, production scheduling, delivery lead time and first to market on business performance in manufacturing industries. It has been observed that problems with some manufacturing industries in the country seem to be a lack of skills set to carry out activities such as production planning. There also seems to be a lack of understanding of what production planning is with regard to how it should be used to the advantage of the organisation and as a strategy to counter future production issues which may occur, such as late deliveries and poor quality products.

1.3 LITERATURE REVIEW

A detailed literature review was undertaken with the aim of assembling material relating to production planning as risk management technique, production scheduling, delivery lead time, first to market as well as business performance within the manufacturing industry. The available literature in the form of textbooks, journal articles, conference papers, newspapers, magazines and the Internet was consulted and sourced to evaluate, develop and integrate the theoretical background of the problem at hand.

1.3.1 Theory of production

The theory underlying this study is the production theory. This theory was introduced by Cobb and Douglas (1928:139) and is the study of production, or the economic process of converting inputs into outputs. Over the years, the progressive refinement in the measurement of the volume of physical production in manufacturing suggests the possibility of the following: first, to measure the changes in the amount of labour and capital which has been used to turn out this volume of goods and secondly, to determine what relationships exists between the three factors of labour, capital and product (Cobb & Douglas 1928:139). Production uses resources to create a good or service that is suitable for use, gift-giving in a gift economy, or exchange in a market economy (Pokrovski, 2002:759). This includes manufacturing, construction, storing, shipping and packaging. Some economists define production broadly as all economic activity other than consumption. The theory involves some of the most fundamental principles of economics. The basic concepts of production theory are inputs and outputs. An input is a good or service that goes into the production process. Economists refer to input as anything which a firm buys for use in its production process. An output, on the other hand, is any good or service that comes out of a production process (Pokrovski, 2002:759). Hence, this theory has been used as a cornerstone to understand production planning processes and activities in the manufacturing environment.

1.3.2 Production planning

Production planning correlates complexities in production. It has subsets which consist of process planning and machinery capacity, delivery lead time and layout (Takahashin, Onosato & Tanaka, 2014:105). Production planning is a process that links together the performance of functions such as job size, machine load and requested delivery as one process (Sharma & Balodiya, 2013:42). Of the main concerns of production planning are to produce default free products and to satisfy customers by delivering jobs on time. The production planning process uses a material requisition plan along with job size, safety stock and planned lead time (Altendorfer, 2015:478).

1.3.3 Production scheduling

Production scheduling looks at aligning the allocated job sequence problems, job production size, machine capacity and order size requested. It pertains to establishing the timing of the use of specific resources in a firm (Nguyen *et al*, 2020:66). The main difference between production planning and production scheduling is that planning takes the material requisition plan, customer orders and material production into consideration to draw up a production plan that will ensure customers' orders will be ready on time.

Production scheduling focuses on implementing the production plan and converting work orders once they have an execution tie period allocated to them (Wang & Zheng, 2013:170). This relates with the overall production scheduling plan for the production process within some given period to give an idea to management as to what quantity of materials and other resources is to be procured and when, so that the total cost of operations of the organisation is kept to the minimum over the period (Bagshaw, 2014:38). Scheduling is an important aspect of operations control in both manufacturing and service firms with increased emphasis on output levels and lead time in meeting demand and in satisfying the customer (Ehma & Freitag, 2016:589). Production scheduling has been found to influence business performance in manufacturing firms (Umoh *et al*, 2013:18; Bagshaw, 2014:40; Ehma *et al*, 2016:588).

1.3.4 Lead time

Delivery lead time is widely considered to be a key measurement of service quality which significantly influences consumers' relationship with companies (Yang *et al*, 2017:677). Cannella, Dominguez and Framinan (2017:125) define lead time as the time between customers placing their order to the point of receiving their order. Planned lead time refers to the planned time between the production order completion date and the order release date to customers (Wang, Mahapatra & Milne, 2015:220). Strauss, Gulpinar and Zheng (2020:15) have found that lead time is positively associated with business performance because of customer satisfaction through which the placing and receiving of orders are satisfactory to the consumers. Mae and Ohno (2012:30) have found that changing lead time on inbound logistics impact performance in a supply chain environment. In general, the philosophy of the JIT (delivery lead time) theory aims at the minimisation of product defectiveness, through the simplification of the production processes (Vranakis *et al,* 2013:338), namely to what extent a firm can accomplish to manufacture the exact number of products demanded by the customers, in the minimum possible time, without stocking inventory in its warehouses. The achievement or not of delivery lead time is an intra-firm factor that determines the performance of the firm and depends on the management's decisions (Vranakis *et al,* 2013:338). Hence, this study posits that delivery lead time influences business performance within the manufacturing environment.

1.3.5 First to market

First to market or early market entrants, according to Wang and Deng (2016:6003), is when an organisation is able to penetrate a specific market faster than their competitors which enables these organisations to gain higher customer share. First to market firms are able to gain sustainable competitive advantage and create a barrier for new entrants into the market. There are risks involved such as failing to keep and grow their customer share and losing to the opposition (Song, Zhao & Benedetto, 2013:1143). Market entry timing is a critical strategic decision that firms entering new markets have to take. If done correctly, these firms can establish strong resource position barriers for their competitors that ultimately lead to business performance (Klein & Jakopin, 2012:369). Previous researchers have shown that order of entry significantly affects the firm's performance in the market (Robinson & Fornell, 1985:306; Lambkin, 1992: 6). They suggest that early entrants (pioneers) enjoy enduring competitive advantages over followers (early followers and later entrants) which translates into a higher level of market share and profitability (Mittal & Swami, 2004:15).

1.3.6 Business performance

If businesses can consistently provide their customers with the desired quality and quantity of the products demanded at an acceptable price, this may assist the business in gaining a competitive advantage over their competitors (Pham, 2020:723). For a business to be successful over a long period of time, the business has to have an internal foundation and management over their operations in order for inbound and outbound movement to run smoothly (Williams *et al,* 2013:1836). Gomez, Lanzolla and Maicas (2016:271) state that one of a managers toughest and most important responsibilities is to evaluate the performance of their business and this is done through performance appraisal which is important. The selection of the suitable strategy cannot bring the desired results by itself (Vranakis *et al,* 2013:337). Firm and production strategies must conform to one another and reflect the performance and environment of the firm. In the past few years, a vast amount of approaches-theories have been developed regarding the improvement of the firms' operational performance. In particular, the enhancement of the manufactured product quality, direct response to market demands, minimal delay on the firm's behalf and, of course, minimal production cost have been emphasised (Vranakis *et al*, 2013:339).

1.3.7 Conceptual model and hypothesis development

The proposed conceptual model attempts to explain the effect of production planning on production scheduling, delivery lead time, first to market and its relationship with business performance. The proposed model is shown in Figure 1.1.

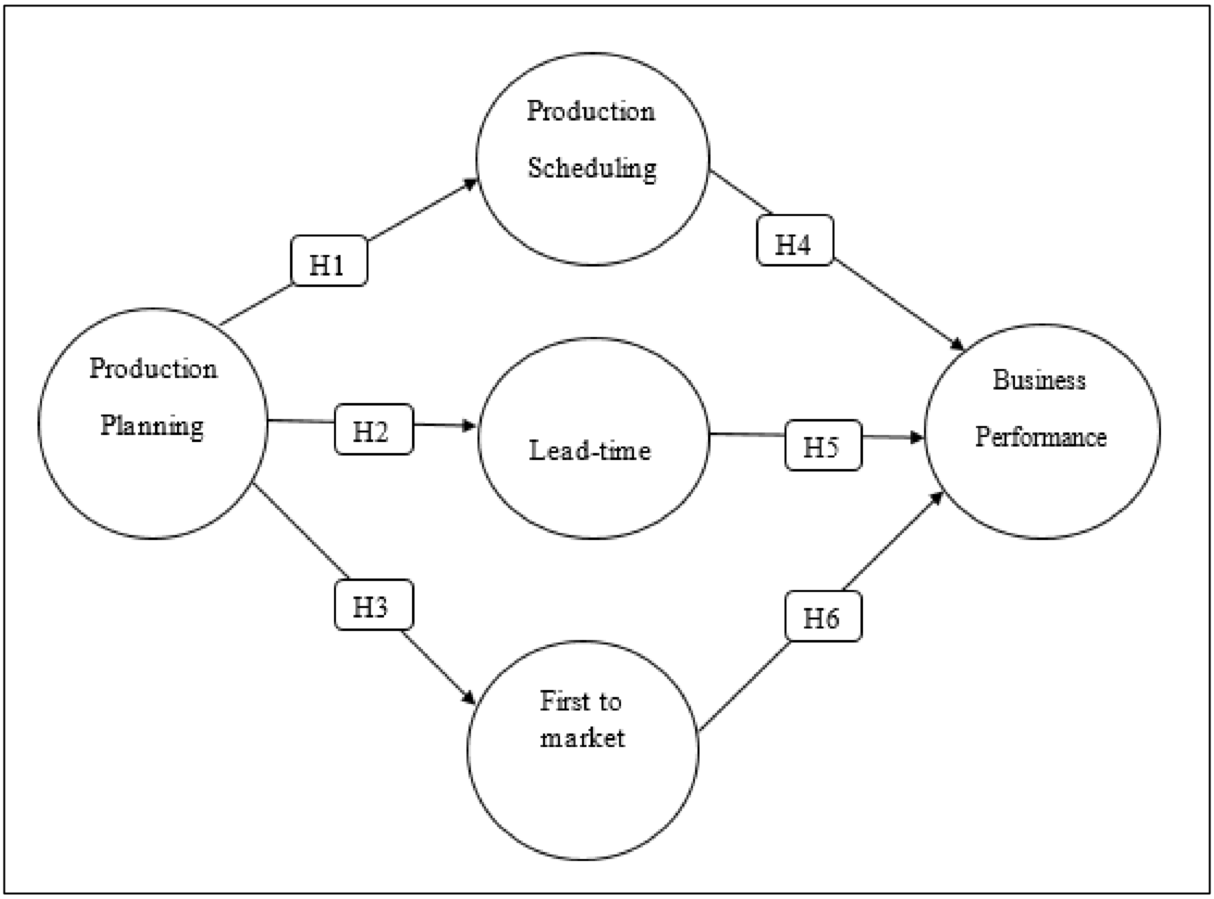

Figure 1.1: Conceptual framework

Based on these relationships espoused in the literature, the following hypotheses were formulated:

H1: Production planning influences production scheduling within the manufacturing industry.

H2: Production planning positively influences delivery lead time of goods in the manufacturing industry.

H3: Production planning positively affects first to market activities within the manufacturing industry.

H4: There is a positive relationship between production scheduling and business performance.

H5: Lead time positively affects business performance within the manufacturing industry.

H6: There is a relationship between first to market and business performance.

The following are a set of null hypotheses associated with the study:

H1: Production planning is equivalent to production scheduling in the manufacturing industry.

H2: Production planning improves delivery lead time of goods in the manufacturing industry.

H3: Production planning is unrelated to first to market activities within the manufacturing industry.

H4: There is no relationship between production scheduling and business performance.

H5: Lead time results in better business performance within the manufacturing industry.

H6: There is no relationship between first to market and business performance.

1.4 RESEARCH OBJECTIVES

1.4.1 Primary objective

The purpose of the study was to examine the influence of production planning on business performance as a risk management technique in the manufacturing industry.

1.4.2 Theoretical objectives

The following theoretical objectives were formulated for the study:

- To review the literature on production planning as a risk management technique.
- To review the literature on production scheduling influencing business performance.
- To review the literature on lead time delivery influencing business performance.
- To review the literature on first to market strategy affecting business performance.
- To review the literature on business performance within the manufacturing industry.

1.4.3 Empirical objectives

- To determine the influence of production planning on production scheduling.

- To determine the influence of production planning on lead time delivery.
- To ascertain whether production planning influences first to market.
- To investigate the influence of production scheduling, delivery lead time and first to market on business performance in the manufacturing industry.

1.5 RESEARCH DESIGN AND METHODOLOGY

A research design is a master plan that specifies the methods and procedures for collecting and analysing needed information for a research study (Soelton, Lestari & Arief, 2020:188). Research methodology on the other hand is the compilation, organising and examination of data. It also hatches conclusions (Malhotra, 2010:75). It is concerned with corroboration, dismissal, or modification of the hypothesis by testing its results in a specific situation. Although this pattern is a useful reconstruction of some methods of scientific inquiry, it is not to be considered the only scientific method. There are many ways of applying logic and observation to solve a problem. A fixed definition of a research process would distort many ways in which researchers go about their task (Singh & Bajpai 2007:19). Two methods of research were undertaken, namely a literature review and an empirical study.

1.5.1 Literature review

A literature review can be described as an analysis of the progression of a theory by debating various sources of information. The aim of a literature review is to highlight and bridge the gap between the known and unknown (Moldavska & Welo, 2017:744). For purposes of this study, the literature review aims to highlight the role played by production planning as a risk management technique. Chapter 1 provided the background of the study and the theories behind it. It highlighted the problem statement and research objectives. Chapter 2 provides an in-depth analysis of the South African manufacturing industry, the important role played by manufacturing in the economy and challenges faced by all manufacturing companies. This chapter also describes the entirety of the theory of production and the notion of each variable being discussed in the study. Chapter 3 outlines the research methodology with a discussion of topics such as research paradigms, research approaches, research designs, sampling designs, data collection method and the reasoning behind each selected method. Finally, chapters 4 and 5 provide the data interpretation and results of the study.

1.5.2 Empirical design

Research can be classified into two sets, namely qualitative and quantitative research paradigms (Mansourian & Maddan, 2007:94). Both qualitative and quantitative research approaches work in a complementary way. Some researchers take the first approach and argue that there is a similarity between social and natural phenomena and that similar methods can be used to study both phenomena (Creswell, 2014:119). This study employed the quantitative approach because it deals with numbers, employs statistical methods to analyse data and is associated with the positivist research perspective (Sedmak *et al*, 2010:81).

1.5.2.1 Sampling design

The following steps, as recommended by Parasuraman and Grewal (2008:225), were followed in developing the sampling procedure for the empirical study.

1.5.3 Target population

A population is a group of entities with a common set of characteristics (Wiid *et al*, 2015:184). The target population was composed of operation managers, production planners and supply chain practitioners in the manufacturing sector. For this study's purpose, both male & female constituted the sample from all the racial groups in South Africa from the demarcated area.

1.5.4 Sample frame

A sampling frame is a list or other device used to define a researcher's population of interest (Yadav *et al*, 2018:506). It defines a set of elements from which a researcher can select a sample of the target population. Handcock and Gile (2011:2) maintain that there is a lack of a serviceable sampling frame in most quantitative studies, especially using non-probability sampling approach. Therefore, in this study, the manufacturing firms within Gauteng were used as a physical sampling frame where the sample was drawn.

1.5.5 Sampling method

Probability sampling and non-probability sampling are the main types of sampling (Pellissier, 2007:228). In probability sampling, each element of the population has a known positive probability of being selected as a unit of the sample, whereas in non-probability sampling, the probability that a specific unit of population selected is not known (Wiid *et al*, 2015:199).

Probability sampling utilises a random selection of elements to reduce or eliminate sampling bias (Schmidt & Tawfik, 2018:7). A probability sample includes simple random sampling, systematic probability sampling, stratified probability sampling and cluster probability sampling(Yadav *et al,* 2018:505).

The current study adopted the probability sampling approach using the random sampling method. The reason for this was because this technique is known to provide more accurate results.

1.5.6 Samples size

Sample size refers to the elements to be included in a research study (Gupta, 2011:196). Sample size determination depends on a number of considerations, including time and cost. For this study, the historical evidence approach was used to determine the sample size. Based on past research studies undertaken by Mae and Ohno (2012:19), Umoh, Wakocha and Amah (2013) and Bagshaw (2014), the sample size of 300 is regarded large enough to make a good representation of employees in the manufacturing industry using non-probability sampling. Furthermore, the general recommendation in most quantitative studies is that the sample size should be sufficiently large, that is, approximately 200 or more observations (Wiid *et al,* 2015:199). This study will use a sample size of 350.

1.5.7 Data collection method and measuring instrument

Primary data collection was done through a survey using a semi-structured questionnaire. The questionnaire comprised six sections. Section A comprised biographical data of the respondents, based on dichotomous and multiple-choice questions. Section B comprised questions on production planning. Section C comprised questions on production scheduling. Section D comprised questions on delivery lead time. Section E comprised questions on first to market (pioneers). Lastly, Section F contained questions on the business performance of the manufacturing firms.

Measurement items on production planning were adapted and used from previous research projects by Sharma and Balodiya (2013:43). Production scheduling items were adapted from De-Snoo, Van-Wezel and Wortmann (2011:1357), delivery lead time scale items were adapted from Menachof, Bourakis and Makios (2009:352) and first to market measurement items were adapted from Lakhal (2009:645). Business performance questionnaire items were adapted from

Uma, Lyonsb, Lamb, Cheng and Dominguez-Pery (2017:26). Sections B to F applied a five-point Likert scale with anchors ranging from (1) strongly disagree to (5) strongly agree. All statements were rephrased to fit the context of the present study.

1.6 STATISTICAL ANALYSIS

Data is captured using a Microsoft Excel spreadsheet and then later transferred to the Statistical Package for Social Sciences (SPSS) (version 25.0) for Windows (SPSS 2018) software. Descriptive statistics in the form of tabulations, frequencies and mean were used to examine the composition of the sample. Factor analysis and correlations were also employed.

1.7 RELIABILITY AND VALIDITY

Reliability is the extent to which a scale produces consistent results if repeated measurements (Dametew *et al*, 2019:27). Approaches for assessing reliability include test-retest, alternative forms and the Cronbach's alpha coefficient. The study used the Cronbach's alpha coefficient to assess and present its reliability. The values ranged between zero and one. It stated that if the alpha was between 0.51 to 0.60, it was moderately acceptable and if it was above 0.70, it was acceptable (Malhotra, 2010:319). The Cronbach's alpha measures internal consistency or scale items (Malhotra, 2010:319).

Validity is the degree to which a test or instrument measures what it should measure (Maree, 2007:21). Researchers often refer to three types of validity for the testing of the scale (Robinson, 2018:745):

- Convergent validity: a measure where items are required to relate to other measures within the same construct (Zikmund & Babin, 2010:44).
- Criterion validity: checking the scale to ascertain whether it can give accurate predictions, usually of the dependent variables (Maree, 2007:216).
- Discriminant validity: considers the extent to which a measure from one construct does not relate to another (Robinson, 2018:745).

Furthermore, validity verification includes testing for convergent validity and discriminant validity. Convergent validity was represented through factor loadings and average variance extracted (AVE). Discriminant validity is dependent on the essential that the square root of average value extracted (AVE) must be much larger than all other cross-correlations; then discriminant validity is proved (Robinson, 2018:747).

1.8 ETHICAL CONSIDERATIONS

Most societies also have legal rules that govern behaviour, but ethical norms tend to be broader and more informal than laws (Rhode, Bowie & Hergenrather, 2003:71). Ethics in research refers to the norms or standards that guide the research process (Gupta, 2011:21). This study was guided by the following ethical principles during data collection:

- Participation in the study was voluntary.
- The researcher strived to avoid bias in data analysis and data interpretation.
- The researcher informed the respondents about the purpose of the survey, which was in line with the principle of informed consent.
- The questionnaire did not contain any questions detrimental to the self-interest of the respondents.
- The confidentiality and anonymity of respondents were assured; personal data of respondents were processed fairly and lawfully and used only for the purpose of the study.
- The main findings of the study would be made available to respondents upon request.

1.9 OUTLINE OF THE STUDY

Chapter 1: Introduction and background of the study

This chapter provided an introduction and background to the study. The chapter also highlighted the problem statement and research objectives guiding the study. The research design and method used were also outlined. The data will be collected and captured on micro soft excel, the reliability and validity of the data is also assessed for consistency and accuracy of the results. Lastly the ethical considerations of this study are outlined.

Chapter 2: Literature review

This chapter focuses on evaluating the manufacturing industry. The chapter further highlights how processes such as production planning play an effective role in ensuring that the plant runs smooth. The literature review discusses the theory of production; the role, concepts, principles and the processes associated with production planning. Production scheduling, delivery lead time and first to market constructs are discussed and interrogated. Lastly, the chapter provides a comprehensive overview of manufacturing business performance.

Chapter 3: Research methodology

This chapter provides a detailed description of the research methodology used in the research study, focusing on the research method and design that were adopted, the face-to-face interviews and the development and distribution of the questionnaires. A structural equation modelling is a technique which is part of the statistical methods designed to test a conceptual and the study is tested through the Smart PLS 3 software A brief description on ethical issues is provided. The chapter explains pre-test, reliability and validity of the data gathered for the study.

Chapter 4: Results and findings

Chapter 4 reports the results of the empirical study through an analysis of the data. Interpretation and evaluation of the research findings, reliability and validity of the research instrument are assessed.

Chapter 5: Conclusions and recommendations

This chapter provides a final review of the entire study and provides conclusions and recommendations emanating from the study, in an attempt to address the research objectives and hypotheses. The implications and limitations of the study are discussed and areas for further research presented.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The aim with this chapter is to discuss the literature on the manufacturing industry globally and to provide an outlook on the South African manufacturing industry and how it has contributed to the South African economy to date. The chapter lays out the gap between South African manufacturing industries in comparison to global manufacturing industries. It also outlines the importance of the manufacturing sector as well as the challenges faced by manufacturing sectors. The chapter further details and acknowledges that there are various factors that influence the business performance of manufacturing industries but for the purpose of this study, four variables, namely production planning, the role played by delivery lead time, production scheduling and the impact that being the first to market leader has on the performance of manufacturing industries have been identified.

This chapter unpacks each variable independently, showing whether the variable is multidimensional and providing the variables antecedents and dimensions. Each variable is discussed critically to give an in-depth understanding of the variables and how each variable plays a role in either the success or failure of a business. The chapter also elaborates on the theory of production, where this theory originates from as well as studies conducted that prove that there is a positive relationship between the variable as well as the measurement instrument which are adopted. The structure of the chapter seeks to give a broad understanding of manufacturing practices globally to better benefit the South African market.

2.2 GLOBAL MANUFACTURING INDUSTRY

Globalisation has increasingly incentivised the global manufacturing processes through which capital is channelled to developing countries for production, where after the products are brought to developed countries for consumption.

The practices of supply chain management are increasingly becoming prerequisites for the maintenance of organisational competitiveness and sustaining profitability Mwalim, Egessa & Evans (2019:4). According to Matthew and Othman (2017:2), in recent years, the rapid change in the global economy has given the manufacturing industry a growing focus on understanding and implementing supply chain roles in firms to counter organisations experiencing bottlenecks with distributing products on time at the lowest cost. In future, manufacturing, factories must cope with the need of rapid product development, flexible production as well as complex environments, which create the need for a smart future. The German manufacturing industry adjusted their production, focusing on customised products and fast time to market, leveraging the advantages of novel production strategies such as agile manufacturing and mass customisation (Brettel, Friederichsen, Keller & Rosenberg, 2014:38).

A vast amount of approaches-theories have been developed regarding the improvement of firms' operational performance, the enhancement of the manufactured product quality, direct response to market demands, the minimal delay on the firm's behalf and, of course, the minimal production cost (Vranakis *et al*, 2014:337).

A manufacturing industry is an organisation whose core function is the linear mode of production of raw materials which are extracted, processed and assembled into finished goods for consumption (Dametew *et al*, 2019:25). However, Cheruiyot (2017:47) argues that manufacturing industries are those organisations whose core function is to transform raw materials, goods or substances into new products; this transformation can be mechanical, chemical or physical. Cheruiyot (2017:47) and Zahraee and Zahraee (2016:140) confirm this by defining a manufacturing industry as an organisation that follows a series of steps to transform raw materials into finished products for consumption through the process of turning input into output. This study adopted the definition from Böckin, Willskytt, Tillman and Söderman (2016:1), which describes a manufacturing industry as the linear mode of production of raw materials, which are extracted, processed and assembled into finished goods for consumption.

According to The National Bureau of Statistics of China, a crucial role in China's economic growth; China's manufacturing sector has accounted for 93.31 % of the industrial enterprises whose business income is above 500 million Yuan per annum (Li & Lin, 2016:12). China continues to be amongst the leading countries that leveraged substantial profitability for their economy through the manufacturing industry (Edwards & Jerkins, 2015:4). Exports are the main component to the Chinese economy with only 8 % of China's manufacturing output being sold domestically. According to Yao and Deng (2016:7144), countries such as India, China and Brazil have increased their efforts in research and development in their emerging economies. These countries host an incredible pool of high-quality technological infrastructure, engineers, science as well as markets with rapidly growing consumer power.

In Malaysia, the government has established a federation of Malaysian manufacturing by identifying that supply chain management and excellence are critical for global competitiveness (Tripathi, Stanton, Strobino & Bartlett, 2019:7). Due to an understanding that economic growth and gross domestic product (GDP) depend on the success of the manufacturing industry, the government provides support to the local industry with automated processes of supply chain management to aid in the transformation, comprehensiveness and competitiveness of their manufacturing industry at a global level (Matthew *et al*, 2017:2).

Looking at the African continent, as mentioned by Cheruiyot (2017:45), the manufacturing industry in Kenya is comprised of firms, which involve crude petroleum refining, motor vehicle assembly, customer goods processing and industries producing farm implements. The majority of these products are consumed locally and part of these are exported to other sub-Saharan African countries, however, the volume of the exported goods is comparatively low which is attributed to the low-quality nature of some of these goods. As reported by the Kenya National Bureau of Statistics (2015:17), their manufacturing industry constituted 70 % of the sectors contribution to GDP in 2015. Kenya’s vision 2030 identifies that the manufacturing sector will be responsible for achieving a sustained annual growth rate of 10 %.

Table 2.1 illustrates the global ranking of drivers of manufacturing competitiveness. According to Williams, Cunningham and De Beer (2014:8), the figure shows that global nations cannot grow without the necessary talent and advanced skills required for certain jobs. Thus, in order to achieve manufacturing competitiveness, it becomes important to attract and retain talent and appropriate skills for the future.

Table 2.1: Global ranking of drivers of manufacturing competitiveness

Index	Rank	Index Score
Talent-driven innovation	1	10.00
Economic, trade, financial and tax systems	2	8.42
Cost and availability of labour and materials	3	8.07
Supplier network	4	7.76
Legal and regulatory system	5	7.60
Physical infrastructure	6	6.47
Energy cost and policies	7	6.25
Local market attractiveness	8	3.99
Healthcare system	9	2.48
Government investments in manufacturing and innovation	10	1.00

Source: Williams, Cunningham and De Beer (2014:7)

Table 2.1 shows that talent-driven innovation is the highest driver for manufacturing competitiveness. This proves that manufacturing industries globally understand the significant impact that a first to market variable can have if it is executed effectively.

2.3 SOUTH AFRICAN MANUFACTURING INDUSTRY

The South African economy has undergone a profound transformation from monopoly capitalism involving concentration and centralisation of capital, moving from the periphery of the global capitalist system (Djolov, 2015:20). The initial development of the South African manufacturing industry came with the discovery of diamonds in South Africa in 1867, followed by the discovery of gold in 1886 (Southall, 1985:306).

South Africa has the largest and most advanced economy in the Sub-Saharan African region as well as a relatively higher developed industrial sector compared to the rest of Sub-Saharan Africa (Edwards & Jerkins, 2015:4). Manufacturing production in South Africa shrank with 1.4 % year-on-year in July 2017, following a downwardly revised 2.2 % fall in June and a worse than market expectation of a 0.35 % drop (Trading Economics, 2017:2).

Manufacturing is one of the core sectors that inject a large sum of revenue into various nations. Ahmad, Khattak, Khan and Rahman (2020:46) explain that production planning assists in managing operations in the organisation and coordinates the function of transforming raw materials into finished goods to meet demand while avoiding high inventory costs (Sarkodie, Owusu & Leirvik, 2020:5). However, Brand South Africa reporter (2017:4) indicates that South Africa has developed an established, diversified manufacturing base that has shown its resilience and potential to compete in the global economy. As reported by Statistics South

Africa (2018:7), the South African manufacturing industry reported a 1.3 % decrease in employment between September 2017 and September 2018. This was a result of an employment decrease in the metal, furniture, food and beverages sectors. Previous literature from Bhorat and Rooney (2017:4) states that the South African labour market is characterised by a high unemployment rate, inequality and poverty, which the South African government aims to uplift though the National Development Plan from 13 million in 2010 to 24 million by 2030.

The South African government recognises that the manufacturing sector can play an intensive and strategic role in attaining this goal and has thus highlighted this plan in various government policies such as the Industrial Policy Action Plan (Department of Trade and Industry, 2017:5).

The South African manufacturing industry provides a focus of stimulating the growth of services and achieving outcomes such as improved employment creation and economic environment. This sector provides a platform that works towards accelerating South Africa's development and growth (Brand South Africa, 2017:1). However, according to Gowing, Walker, Parkin, Forsythe, Haile and Ayenew (2020:6) and Bhorat and Rooney (2017:4), the South African manufacturing sector has continued to show a decline from 2010 in terms of making a contribution to the economic growth and unemployment, which indicates that the sector is becoming progressively less competitive.

The South African government further recognises the importance of the development of the country's advanced manufacturing potential, besides conventional manufacturing (Ahmad *et al*, 2020:47). The Department of Trade and Industry (2017:3) reported that the agricultural and mining sectors have the biggest impact on economic growth in South Africa. These sectors contribute directly to the GDP, employment and human capital development. It is important for the economy to shift from being a resource-based economy to a knowledge-based economy through technological innovation. This will be channelled through the Department of Science and Technology and the Department of Trade and Industry.

In 2016, the manufacturing sector dropped by 3.1 %, which brought a decline in the manufacturing of food, beverages, petroleum, chemical products, plastic, motor vehicle parts and accessories, this sector grew by 2.1 % in the last quarter of 2018 (Mosai, 2017:5). Statistics South Africa (2018:3) confirm this by reporting that manufacturing production increased by 0.1 % in September 2018 with the largest contributing divisions coming from the food and beverage sector, steel, iron and metal products and furniture.

Table 2.2 is an equal comparison on the South African manufacturing perspective on drivers of manufacturing competitiveness (Williams, *et al*, 2014:10). The table shows that South African manufacturing firms prioritise healthcare systems, which relate to their employees' health, as well as government investment as a key driver of growth and competitiveness.

Table 2.2: South Africa's top ranking of drivers of manufacturing competitiveness

Index	Rank	Index Score
Talent-driven innovation	1	7
Economic, trade, financial and tax systems	2	4
Cost and availability of labour and materials	3	1
Supplier network	4	6
Legal and regulatory system	5	9
Physical infrastructure	6	5
Energy cost and policies	7	3
Local market attractiveness	8	2
Healthcare system	9	10
Government investments in manufacturing and innovation	10	8

Source: Williams, Cunningham and De Beer (2014:8)

Table 2.2 shows that in the South African industry, strategic functions such as cost and availability of labour and energy cost and policies are ranked at a lower level. This highlights the misalignment and gap that South Africa has with the global direction and growth in the manufacturing industry.

2.4 IMPORTANCE OF THE MANUFACTURING INDUSTRY

Manufacturing is one of the core strategic functions of an organisation to improve competitiveness and plan management strategies of the organisation (Zahraee *et al*, 2016:140). Cheruiyot (2017:45) identifies the manufacturing industry as the engine that drives the economic growth of companies through job creation and trade facilitation within a country. Kamath and Saurav (2016: 13) state that the manufacturing industry works hand-in-hand with supply chain management as it ensures that firms compete with each other to get advantage through reduced delivery lead times and first to market.

2.4.1 Economic development and growth

A variety of nations aim to create a high-performing manufacturing sector in order to develop national wealth and economic growth (Alvarez & Perry, 2015:13). Zalk (2014:6) argues that the rapidly growing manufacturing sector plays a significant role in stimulating, developing and driving growth in the economy. South Africa has actively developed a diversified manufacturing sector that has strong potential to improve the growth and development of the country, directly and indirectly, as well as compete amongst global economies (Brand South Africa 2018:2). Wages paid to employees in the manufacturing industry are reinvested in other aspects of the economy; thus, manufacturing indirectly adds value and actively grows the economy. A study conducted by Afrobarometer (2019:3) found that in 2018, the World Bank placed South Africa as number 82 out of 190 countries, which are easy to do business with. This is a decline from the 32nd position that South Africa held in 2008 and it was addressed in the State of the Nation Address by President Cyril Ramaphosa in February 2018, affirming his government's commitment to get the country back into the top 50 global performers within three years.

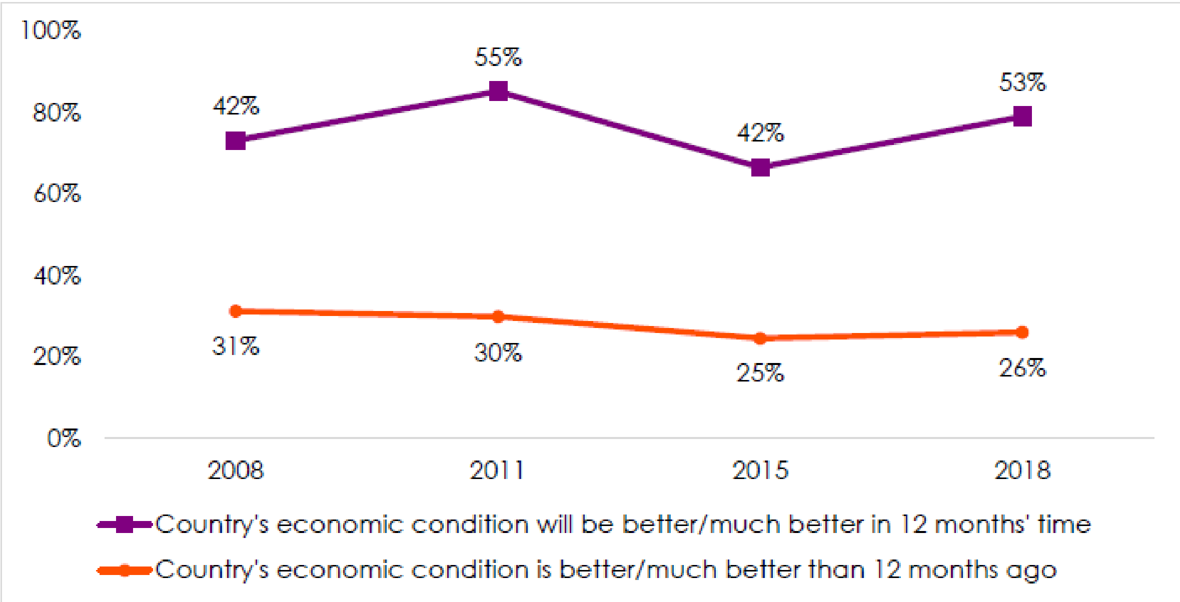

Figure 2.1: South African citizens perception on economic conditions of the country

Source: Afrobarometer (2019:4)

Figure 2.1 illustrates the results of a survey carried out by the Afrobarometer in 2019, showing how South African citizens thought the economic conditions of the country were 12 months before versus how it would be in the next 12 months. It shows that in 2018, 53 % of citizens perceived that the economy would be much better in 12 months' time. It also shows that in 2018, 26 % of citizens believed the economy was in a better state 12 months before.

The pace of China's economic, social and foreign trade growth as compared to the national average has increased and China is said to become the largest economy by 2030 (Tong & McManus, 2017:283).

2.4.2 Employment creation

For each manufacturing job, three other jobs are created in the wider economy through a principle referred to as the multiplier effect. Manufacturing is an important aspect of the South

African economic policy as it actively creates jobs in the economy (Bhorat *et al*, 2017:4). Afrobarometer (2019:5) mentions that although, in 2017, the rapid changes in manufacturing technologies often resulted in a decline in the performance of the South African manufacturing sector, the sector still showed job multiplication in service sectors, which sustained and grew the economy (DTI, 2017:2). According to Statistics South Africa (2018:4), there is still a huge gap for improvement in capacity utilisation across various manufacturing sectors.

Table 2.3 illustrates capacity used in the various manufacturing industries in South Africa for 2018 vs 2019, as well as measure capacity constraints in the manufacturing industry. The difference between the two years depicts that the majority of these divisions are not operating at full capacity and thus, there is still some room for maximising productivity.

Table 2.3: Utilisation of production capacity in the manufacturing industry by division

Manufacturing divisions	**Weights**	**February 2018 (percent)**	**February 2019 (percent)**	**percent point difference between February 2018 and February 2019**
Food and beverages	25.78	81.3	81.4	0.1
Textiles, clothing, leather and footwear	3.21	727	71.9	-0.8
Wood and wood products, paper, publishing and printing	11.28	82.4	82.2	-0.2
Petroleum, chemical products, rubber and plastic products	23.82	81.9	84.5	2.6
Glass and non-metallic mineral products	3.53	79.5	77.9	-1.6
Basic iron and steel, non-ferrous metal products, metal products and machinery	18.74	76.3	76.6	0.3
Electrical machinery	1.63	79.1	78.7	-0.4
Radio, television and communication apparatus and professional equipment	1.60	84.8	81.5	-3.3
Motor vehicles, parts and accessories and other transport equipment	7.20	82.3	82.6	0.3
Furniture and other manufacturing	3.22	80.7	78.2	-2.5
Total manufacturing	**100**	**80.5**	**80.8**	**0.3**

Statistics South Africa, (Manufacturing 2019:3)

As per Table 2.3, the top manufacturing divisions indicated a decrease in the utilisation of production capacity, these statistics for February 2018 vs February 2019 show that radio, television and communication apparatus and professional equipment production capacity utilisation decreased by 3.3 percent.

Table 2.4: Annual utilisation in radio, television and communication apparatus and professional equipment

Manufacturing divisions and major groups				Utilisation	Reason for under-utilisation					
					Total under-utilisation	Shortage of			Insufficient demand	Other
						Raw material	Labour			
							Skilled	Semi-and unskilled		
Division: Radio, television and communication apparatus and professional equipment	**Weight = 1,59**		**Feb**	**84.2**	**15.8**	**1.0**	**0.0**	**0.0**	**14.4**	**0.4**
			May	**86.4**	**13.6**	**0.5**	**0.0**	**0.0**	**12.8**	**0.3**
			Aug	**85.0**	**15.0**	**1.1**	**0.0**	**0.0**	**13.5**	**0.4**
			Nov	**86.0**	**14.0**	**1.0**	**0.0**	**0.0**	**12.6**	**0.4**
		2017	**Year**	**85.4**	**14.6**	**0.9**	**0.0**	**0.0**	**13.3**	**0.4**
			Feb	**84.8**	**15.2**	**0.8**	**0.0**	**0.0**	**13.9**	**0.5**
			May	**82.1**	**17.9**	**1.1**	**0.0**	**0.0**	**16.3**	**0.5**
			Aug	**80.5**	**19.5**	**1.3**	**0.0**	**0.0**	**17.0**	**1.2**
			Nov	**83.2**	**16.8**	**1.0**	**0.0**	**0.0**	**14.6**	**1.2**
		2018	**Year**	**82.7**	**17.4**	**1.1**	**0.0**	**0.0**	**15.5**	**0.9**
		2019	**Feb**	**81.5**	**18.5**	**1.3**	**0.0**	**0.0**	**16.0**	**1.2**

Source: Statistics South Africa (Manufacturing 2019:12)

Table 2.4 illustrates the opening utilisation for radio, television and communication apparatus and professional equipment in February 2017 at 84.2 %, which increased by 1.2 % by the end of that year. February 2018 opened at 84.8 %, showing a slight decrease of 0.6 % as a result of the lack of demand during the year 2018. Lastly, February 2019 shows a further decrease of 1.2 % from the closing figure for 2018. This was also as a result of the lack of demand for radio, television and communication apparatus and professional equipment. Furniture and other manufacturing decreased by 2.5 %.

Table 2.5: Annual utilisation in furniture and other manufacturing

Manufacturing divisions and major groups				Utilisation	Reason for under-utilisation					
					Total under-utilisation	Shortage of			Insufficient demand	Other
						Raw material	Labour			
							Skilled	Semi-and unskilled		
Division: Furniture and other manufacturing industries	**Weight=3,22**		**Feb**	**80.6**	**19.4**	**1.9**	**0.8**	**0.7**	**15.1**	**0.9**
			May	**81.5**	**18.5**	**1.5**	**0.2**	**1.2**	**14.7**	**0.9**
			Aug	**80.5**	**19.5**	**1.4**	**0.2**	**1.1**	**15.9**	**0.9**
			Nov	**82.6**	**17.4**	**1.5**	**0.1**	**1.2**	**13.4**	**1.2**
		2017	**Year**	**81.3**	**18.7**	**1.6**	**0.3**	**1.1**	**14.8**	**1.0**
			Feb	**80.7**	**19.3**	**1.7**	**0.7**	**0.7**	**15.3**	**0.9**
			May	**78.9**	**21.1**	**1.7**	**0.6**	**0.6**	**12.2**	**6.0**
			Aug	**82.5**	**17.5**	**1.5**	**0.8**	**0.4**	**14.2**	**0.6**
			Nov	**85.6**	**14.4**	**1.4**	**0.8**	**0.4**	**11.2**	**0.6**
		2018	**Year**	**81.9**	**18.1**	**1.6**	**0.7**	**0.5**	**13.2**	**2.0**
		2019	**Feb**	**78.2**	**21.8**	**1.3**	**0.5**	**0.7**	**18.7**	**0.6**

Source: Statistics South Africa (Manufacturing 2019:16)

Table 2.5 displays the opening utilisation for furniture and other manufacturing in February 2017 as 80.6 %, which increased with 0.7 % by the end of that year. February 2018 opened at 80.7 %, which showed a slight increase of 1.2 % that was a result of the skilled employees and the slight increase in demand during May and November 2018. February 2019 showed a decrease of 3.7 % from the closing figure for 2018. This was due to the drastic decrease in demand during February 2019 for furniture and other manufacturing products and a slight increase in unskilled employees during February 2019. Glass and non-metallic mineral products decreased by 1.6 %.

Table 2.6: Annual utilisation in glass and non-metallic mineral products

Manufacturing divisions and major groups				Utilisation	Reason for under-utilisation					
					Total under-utilisation	Shortage of			Insufficient demand	Other
						Raw material	Labour			
							Skilled	Semi-and unskilled		
Division: Glass and non-metallic mineral products	Weight=3,53	2017	Feb	79.5	20.5	0.3	0.3	0.0	15.1	4.8
			May	81.3	18.7	0.3	0.1	0.0	14.2	4.1
			Aug	81.3	18.7	0.1	0.0	0.1	14.6	3.9
			Nov	81.8	18.2	0.1	0.2	0.0	14.0	3.9
			Year	81.0	19.0	0.2	0.2	0.0	14.5	4.2
		2018	Feb	80.4	19.6	0.2	0.2	0.0	14.9	4.3
			May	80.5	19.5	0.3	0.1	0.0	14.3	4.8
			Aug	82.2	17.8	1.0	0.1	0.0	13.2	3.5
			Nov	82.6	17.4	0.0	0.0	0.0	14.1	3.3
			Year	81.4	18.6	0.4	0.1	0.0	14.1	4.0
		2019	Feb	77.9	22.1	0.7	0.4	0.0	15.8	5.2

Source: Statistics South Africa (Manufacturing 2019:10)

Table 2.6 demonstrates the opening utilisation for glass and non-metallic mineral products in February 2017 at 79.5 %, which increased by 1.5 % by the end of that year. February 2018 opened at 80.4 %, which shows a slight increase of 1 %, which was a result of skilled employees and the slight increase in demand between August and November during 2018. Lastly, February 2019 showed a decrease of 3.5 % from the closing figure for 2018. This was as a result of the lack of demand for glass and non-metallic mineral products, although the figure for skilled employees increased.

2.4.3 Global trade

In 2017, the World Trade Organisation reported that 80 % of trade dealings between nations were in tangible products and only 20 % were in services. Trade agreements are put in place to create equal and open accessibility markets across various nations. These agreements also create great economic growth opportunities for exporters and manufacturers (WTO 2018:3).

In the event that dealings are linked to political and economic trends, it becomes difficult for manufacturers because they have no control over market factors such as imports and exports, exchange rates as well as energy costs, as these aspects bring about change. It is imperative for manufacturers globally to adhere to the core strategic principles of the trade agreements to ensure long-term stability in the global marketplace (Haraguchi, Cheng & Smeets, 2016:4).

There has been progress to the liberalisation of trade in agriculture, which was a development of the Bali Ministerial Conference that took place in 2013 (Nuetah, 2018:4). This conference affirmed the commitment to reduce trade tariffs and increase domestic support, which previously created distortions for developing countries. This agenda is still underway through the World Trade Organisation and the majority of the developed countries have eliminated these barriers to entry completely, while India and China have invested intensely in systems and programs to actively improve market accessibility for developing countries.

Table 2.7: Tariff rates for developing countries

Developed countries	
Tariff rates	**Average reduction**
Ad valorem rates >75%	70
Ad valorem rates between 50% and 75%	64
Ad valorem rate between 20% and 50%	57
Ad valorem rate between 0% and 20%	50
Developing countries	
Tariff rates	**Average reduction**
Ad valorem rates > 130%	47
Ad valorem rate between 80% and 130%	43
Ad valorem rate between 30% and 80%	38
Ad valorem rate between 0% and 30%	34

Source: Nuetah (2018:13)

Table 2.7 shows the reduction in tariff rates for developing countries through the World Trade Organisation. The table shows that the tariff rates in developing countries are over 20 % lower than those in developed counties.

2.5 CHALLENGES FACED BY THE MANUFACTURING INDUSTRY

There are multiple challenges faced by the manufacturing industry which can hinder the optimum production output of a facility. These challenges can affect the competitiveness, sustainability and bottom-line of the industry in the economy (Cheruiyot, 2017:45).

2.5.1 Global competition

The intensely competitive manufacturing industry globally has led multiple organisations to reconstruct the procedure followed by designing and manufacturing of innovative products. The footing of increased competition globally is due to the rapid changes in technology stemming from countries such as China, South Korea and Taiwan (Yao & Deng, 2016:7144). In order for manufacturers to compete effectively in the global market, it is imperative that firms produce high quality products and services in short lead times at the lowest cost possible while delivering outstanding customer service (Li *et al*, 2016:10). Hossain and Semenza (2017:554) argue that the key to combating competition globally is for organisations to work towards making their product's value known in the marketplace, improving their service, innovation and speed to market as well as being first to market.

2.5.2 Supply chain integration

Supply chain systems provide greater flexibility and production insight that assist with improving production performance effectively and efficiently. According to Matthew and Othman (2017:5), most manufacturing organisations fail to execute supply chain practices effectively. The integration of supply chain practices' production planning and demand planning is essential in manufacturing sectors that have higher product complexity to drive greater revenue for the organisation (Takahashin et al, 2015:110). Supply chain visibility seeks to enhance the existing order management and distribution through aligning and accelerating production systems, as well as improving product quality while minimising waste (Kamath & Saurav, 2016: 28).

2.5.3 Technology advancements

Robotics, automated machinery and cloud computing are some of the technological advancements being developed across the globe and most manufacturers struggle to keep up in the ever-changing technological environment (Edwards *&* Jerkins, 2015:9). By the time organisations begin the process of researching, testing, approving and investing in new equipment and machinery and installing the new technology, a more agile and faster solution is likely to emerge (Ahmad *et al*, 2020:56). Organisations can combat this challenge by partnering with a business consulting agency that has expertise in manufacturing to assist with selecting the most feasible, cost efficient technologies, machinery and equipment and supervise the implementation and training of staff on how to use it in order to secure greater return on investment (Takahashin *et al*, 2015:111). Implementing smart machinery assists manufacturers to gather data that report on the required maintenance of machinery and improves productivity rapidly.

2.6 DOMINANT MANUFACTURING SECTORS IN SOUTH AFRICA

South Africa has demonstrated its diversified manufacturing industry, which continues to show resilience and capability to compete on a global scale. Brand South Africa (2017:1) identifies the following manufacturing sectors as the most dominant in the South African industry:

2.6.1 Agricultural industry

The agricultural sector in South Africa contributes 4 % to South Africa's GDP and it consists largely of sheep and cattle farming with only 20 % of land being used for growing crops (Bates 2014:16). The South African government is constantly working to develop small-scale farming as a means of increasing job creation. This sector is identified by Brand South Africa (2017:2) as an important trading partner due to their world class infrastructure. According to Amanor and Chichava (2016:16), preferential trade agreements with the United States market and the European Union, which are referred to as the Africa Growth Opportunity Act, grants benefits to the country.

In South Africa with its diverse climax ranging between semi-arid, dry to sub-tropical, only a third of the country receives sufficient rain for crop production (Brand South Africa 2017:2). The Agriculture Forestry and Fisheries (2018:3) state that due to the current drought conditions farmers have been facing, all investments undertaken by government will be negatively affected in terms of profitability and productivity.

2.6.2 Automotive industry

In 1992, the South African government appointed motor industry experts (the Motor Industry Task Group) to assess and advise on short-term and long-term strategies that would build and sustain the future of the automotive industry. Government then legislated for local content requirements as motivation for the development of the industry locally and executed the development program (Bhorat & Rooney, 2017:10). Today, this sector is considered by Gandhi (2017:9) as one of the most important sector in the manufacturing industry, because many multinationals source components in South Africa and assemble vehicles for local and global markets. South Africa manages to compete effectively on global scale because the country is able to offer high quality products at competitive pricing. The South African automotive industry continues to develop rapidly – vehicle manufacturers such as Ford, Volkswagen, Toyota and BMW have production plants across South Africa to take advantage of lower production costs. South Africa aims to upgrade key elements in the automotive industry to achieve a competitive advantage internationally as well as work towards becoming the automotive industry of choice (Puchert, Dodd & Viljoen, 2017:6).

2.6.3 Chemical industry

The chemical industry consists of specialty chemicals, commodity chemicals and agricultural chemicals (Briefly, 2020:7). The chemical industry in South Africa has been largely shaped by the regulatory and political environment, which fosters an inward approach and focuses on building small-scale plants with capacities geared to produce for local demand (Moori, Shibao, & Santos, 2017:12). Although this industry is isolated from global competition and has higher raw material prices as a result of import tariffs, the processed goods that are generated locally have not been competitive in export markets (Brand South Africa, 2017:3).

South African chemical companies are focusing on the need to reshape the industry and become internationally competitive. Although the upstream chemical sector is well developed, the downstream sector remains underdeveloped. The industry is of substantial significance to the economy of the country as it contributes 5 % to the GDP. In South Africa, the sector is dominated by Sasol chemical industries, Sasol polymers and Dow sentrachem (Briefly, 2020:7).

2.6.4 Metal industry

The metal industry is the third largest manufacturing industry in the country. It is well developed with a supportive infrastructure and vast natural resources (Jung, Zaefferer, Beielstein, & Rudolph, 2017:425). This iron and steel industry transforms primary steel and iron products from smelting and semi-finished products such as billets, blooms, slabs, railway track material and seamless tubes (Böckin *et al*, 2016:7).

The steel and metal industry contributes 1.5 % towards the South African GDP, making this sector one of the most strategic sectors in the country. The steel sector is a core enabler for other manufacturing industries in the country such as mining, construction, infrastructure, automotive as well as energy. In the Sub-Saharan African region, South Africa has been identified as the only country with steelmaking capabilities, with opportunities for South Africa to supply neighbouring economies (Briefly, 2020:6).

The South African Steel and Metal Industry has taken key steps to work towards becoming more competitive in the global market. Multiple local steelworkers have engaged in continuous productivity improvements (Merchantec, 2014:22).

2.6.5 Textiles, clothing and footwear industry

The South African textile and clothing industry has developed a growth plan that seeks to use all human, natural and technological resources available in order to become the preferred supplier for clothing manufactured in South Africa, both locally and internationally (DTI, 2014:3). This industry is highly diverse and plays an active role to the economy as an employer. Statistics South Africa (2016:4) reports that this sector is one of the most labour-intensive sectors in the entire manufacturing industry.

The textile and clothing industry has undergone multiple technological changes that have transformed the local production of textile into a capital-intensive industry (Zamani, Sandin, Svanström, & Peters, 2018:537). The textile industry has developed effectively to offer a full range of products and services such as natural and synthetic fibre to non-woven products such as weaving, knitting and dyeing of apparel (Brand South Africa, 2017:3).

This industry is one of the few industries that invests in women empowerment, as most of the small and medium enterprises (SMEs) are either owned by women or the majority of shares are held by women. The introduction of the Clothing and Textiles Competitiveness Program established by the Department of Trade and Industry aims to provide capital to the SMEs to invest in competitiveness and improved interventions to help upgrade processes as well as to stabilise local employment (DTI, 2014:4).

2.7 SUSTAINABLE MANUFACTURING

Sustainable manufacturing is the production of products through economically sound practices that reduce negative impacts to the environment while conserving natural resources and energy (Moldavska *et al*, 2017:745). Sustainable manufacturing is a concept used to explain manufacturing activities that are not harmful to the environment throughout the manufacturing process. This term puts emphasis on using processes that result in zero waste and lean manufacturing and do not pollute employees and members of the community (Gupta *et al*, 2015:208). Figure 2.2 presents an example of a sustainable manufacturing system.

Figure 2.2: Sustainable manufacturing system

Source: Jawahir and Bradley (2016:104)

Figure 2.2 shows that the components of a sustainable manufacturing system require production processes to be in place, correct raw materials for production and production systems in order for manufacturing to be sustainable.

2.7.1 Manufacturing cost

In order for a manufacturing company to be efficient, it is important to understand all manufacturing costs. Manufacturing costs refer to the total costs incurred by a firm for converting raw material into finished products. New technologies that have recently surfaced encourage organisations to understand, implement and leverage efficient production (Gürel & Cincioˇglu, 2015: 2755). Gowing, Walker, Parkin, Forsythe, Haile and Ayenew (2020:8) state that the total costs incurred during manufacturing increases when production volumes and production runs increase, in order for an organisation to reduce their total manufacturing costs. It would be ideal to have a production plan detailing the production schedule in order to minimise multiple job changeovers, investing in better technology to assist in the execution of lean manufacturing in the organisation and implementing pulling systems in the organisation to ensure material and goods effectively flow within the factory to the consumer (Wood, Li & Daniel, 2015:239).

2.7.2 Energy consumption

In the last decade, the manufacturing sector alone has consumed almost half of the world's energy, as energy is one of the essential components for manufacturing (Liu, Dong, Lohse, Petrovic & Gindy, 2017:3087). Today, the cost of energy is growing rapidly due to the increase in crude oil prices. According to Hu, Peng, Evans, Peng, Tang and Tiwari (2017:293), for an organisation to reduce the energy consumption of their machinery and equipment, it is imperative that process optimisation is understood because a high amount of energy is consumed during the manufacturing process. The increase in energy prices creates multiple challenges, which manufacturers face across the globe.

2.7.3 Waste management

Waste management is a process of collecting, transporting, treating and disposing of waste. It is about how garbage can be used as a valuable resource. In a manufacturing industry, waste management can be referred to as the process of reducing time, energy, costs and materials used unnecessarily (Ambrus, 2017:6). This is any activity that does not add value to the customers perspective and can be achieved by an organisation through the implementation of the lean manufacturing program.

There are several types of manufacturing wastes, such as overproduction, operational delays and waiting time, holding larger inventories than the minimum required as well as machinery running with no jobs (Ambrus, 2017:6). Mengeloğlu, Başboğa, Atar, Karakuş and Yüce (2018:20) state that an organisation can work towards waste management by applying lean principles, such as kaizen continuous improvement, which looks into how small positive changes can lead to major improvements in an organisation. JIT production as well as level production can assist organisations in meeting customer demand while reducing waste during the manufacturing process as well as interpersonal processes.

2.8 THEORY OF PRODUCTION

The theory underlying this study is the production theory, which was introduced by Cobb and Douglas (1928:139). Production theory is the study of production, or the economic process of converting inputs into outputs. The progressive refinement during the years in the measurement of the volume of physical production in manufacturing suggests the possibility of the following: first, to measure the changes in the amount of labour and capital, which have been used to turn out this volume of goods and secondly, to determine what relationships exist between the three factors of labour, capital and product (Cobb & Douglas, 1928:139).

It is important to understand that the production theory and the theory of cost are both at the heart of business operations and discussions regarding economic organisations in manufacturing processes (Fandel, 1985:46). In 1928, Cobb and Douglas developed a neoclassic production function, which they referred to as C-D production. The function was tested empirically by various authors and showed positive results (Fandel, 1985: 92). The production function reads: $Q = AL^{a} K^{B}$

Q = quantity of output produced

A, $_{a\ ,B}$ = positive constraints

L = quantity used of labour

K = quantity of capital used

The authors assume that for production theory to be applied taking into consideration the conditions of production, which the economics of scale external to the organisation are precluded (Kurz & Salvadori, 1995:33). The authors assume that for the production theory to be applied, a production period of uniform length must be established. Labour should be a visible part in primary input throughout the production. Wages are assumed to be a *post factum* and are paid out at the end of the production period.

An important step in business is the economic conversion of input to output models, which adhere to the production theory. These models divide the firm's production layout area into smaller individual production sectors (Kloock, 1969:22). However, Frank (1969:8) argues that the theory of production can only be established and executed if the production possibilities of converting input-output can present an economic benefit. Commodities and resources refer to the facilities, physical plant and equipment that are available and lastly, that production efficiency has already been established.

Previous research conducted within this field produced significant interest, for example, a few answers and an excessive amount of conflicting results, which inspired debates surrounding this topic. Borjas and Ramey (1994:12), along with Wood (1995:33), state that much of the trends observed in production planning over the last few decades were as a result of the rising need for optimum production performance by manufacturing organisations, while Shatz and Sachs (1996:337), Krugman (1995:54) and Lawrence and Slaughter (1993:17) argue that based on the research they had done, the relationship between production planning and business performance is neither positive nor negative, thus, it is negligible.

Production uses resources to create a product or service that is suitable for use, gift-giving in a gift economy, or exchange in a market economy (Nikolic, Ignjatic, Suzic, Stevanov & Rikalovic, 2017:798), which can include manufacturing, construction, storing, shipping and packaging. Some economists define production broadly as all economic activities other than consumption (Takahashin, Onosato & Tanaka, 2014:105).

The theory involves some of the most fundamental principles that economists refer to as anything that a firm buys for use in its production process; thus, this theory is used as a cornerstone to understand production planning processes and activities in the manufacturing environment.

The basic concepts of production theory are inputs, which are goods and services that go into the production process and outputs (Nikolic *et al, 2*017:797). However, Newman (2015:457) argues that the theory of production is a complex economics method used by manufacturing organisations to determine how much of the products will need to be produced as well as how much of each of the raw materials will be required to meet production requirements. The production theory as a decision-making method that looks at the production of a specific product, specific quantity with specific equipment, determining the specific quantities that ensure profitability (Dosi, Grazzi, Marengo & Settepanella, 2016: 877).

This study adopted the definition provided by Newman (2015:457), which explains the theory of production as an economics method used by manufacturing organisations in order to determine how much of the products should be produced as well as how much of each of the raw materials will be required to meet the production requirements.

2.9 PRODUCTION PLANNING

Production planning is the predetermination of manufacturing requirements of things like available basic materials, detailed equipment, production runs, order priority, money and production processes within the scope of the enterprise for efficient production prior to goods being produced (Ehma *et al,* 2016:585). Takahashin, Onosato and Tanaka (2014:105) affirm this by defining production planning as an effective approach to production management, which aligns process planning, resource planning, execution planning and order management decisions in order to create production efficiency and effectiveness. Production planning is a process that links together the performance of functions such as job size, machine load and requested delivery as one process (Mifdal *et al*, 2015:3).

The definition of Takahashin *et al* (2014:105) was adopted for this study.

2.9.1 The notion of production planning

The notion of production planning, which refers to all processes involved in conversion where different material goods and services are produced, may consist of any kind of productive performance that can be executed in service industries or raw material productions, processing plants as well as finishing plants (Fandel, 1985:2).

The principles of productive relations that correlate between production factors and products or goods can positively assist with the vital task of production planning if these factors are cleared up from the grounds of production considerations. The main objective of production planning is to draw the gross requirement of the manufacturing facility and transform this into production orders and material purchases through the use of methods such as EOQ (Economic Order Quantity) and MRP (Material Requirement Plan). These methods can determine the expected lead time (Plenert, 1993:257).

The process of production planning identifies activities that need to be performed in order for the manufacturing plant to efficiently execute the production plan, namely identifying the production program, selecting the production procedure, identifying the potential productivity of the manufacturing plant as well as understanding the process planning (Dantzig, 1951:340).

A manufacturing plant can usually produce a variety of products to satisfy a certain demand, depending on the target market. This encourages organisations to determine, which product to produce through putting together the production factors at hand. The organisation must decide on the product type as well as required quantities in order to make good profits for the established planning period (Fandel,1985:20). Poor production planning consequently results in poor business performance within the manufacturing industry (Gomez *et al,* 2016:270). Firm and production strategies must conform to one another and reflect the performance and environment of the firm (Vranakis *et al,* 2014:336). Theoretically, manufacturing firms are expected to adopt best practices directly related to production planning. These often include production planning, production scheduling and delivery lead time as well as first to market in the environment of demand uncertainty.

Selecting the right production procedure requires understanding how production can be best distributed amongst the equipment available in the production plant. Understanding machinery efficiency is a vital key to selecting the correct production procedure (Sobeyko *et al,* 2017:400). Less efficient machinery tends to result in greater production cost per unit, while machinery that is more efficient requires higher capital investment for equipment. The decision thus requires an understanding of the production area as well as the production procedure (Xue & Offodile, 2020:5). In order to realise productive potential, it is important to have an understanding of the selected production procedure, plant equipment or machinery, required skills in personnel, raw materials and plant layout. This assists in providing clarity on the optimum productive capabilities in a manufacturing plant (Dametew *et al,* 2019:25). The production process can only be planned for, once the activities required for production to take place are established. These could include the intended product to be produced, quantities required, availability of resources and available production capacity to ultimately deliver the desired results through the planning process.

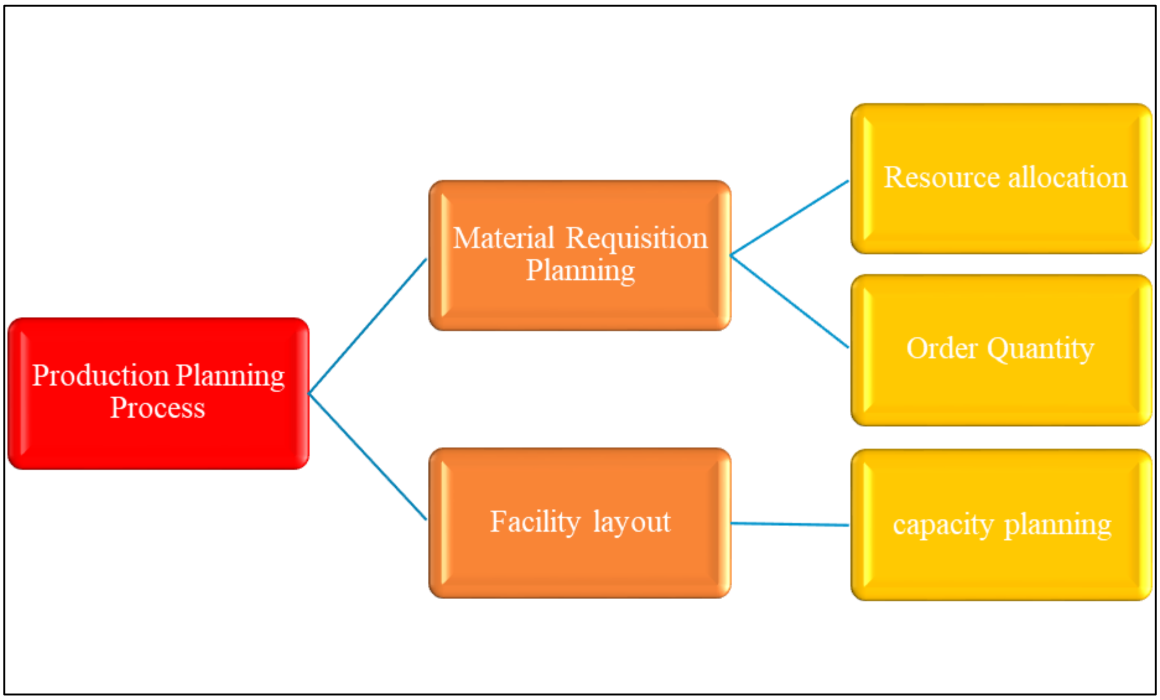

Figure 2.3: Production planning process

Source: Developed by researcher

Figure 2.3 illustrates the elements and process of production planning. The two most vital requirements for the production planner in order for manufacturing to be carried out effectively, efficiently and to achieve optimum production results, are understanding the facility layout and machine capacity.

Production planning requires material availability and material requirements to be aligned in order for the order quantity to be realised. Production planning should be employed by organisations as a strategic management approach, which seeks to coordinate and enhance performance of all manufacturing functions and activities (Seyedhosseini & Ghoreyshi, 2014:2). Kaltenbrunner, Huka and Gronalt (2020:120) argue that production planning correlates complexities in production. It has subsets, which consist of process planning and machinery capacity, delivery lead time and layout. According to Ehma and Freitag (2016:585), production planning is a necessity for any manufacturing company and it should be carried out in such a way that demand and supply are balanced within the company and the right product quality is achieved. One of the main concerns of production planning is to produce defect-free products and to satisfy customers by delivering jobs on time. The production planning process uses a material requisition plan along with job size, safety stock and planned lead time to see how best production can be performed (Altendorfer, 2015:478).

Empirical evaluation proves that knowledge and understanding of factors such as production planning, machinery and equipment's capacity directly affect the firms' capacity maximisation, which positively reflects on profitability (Mostafa, 2020:986). Machinery and equipment investments directly affect the production process levels, which make this factor an antecedent to production planning.

The availability of products, which entails providing inventory to consistently meet customers' requirements and material or product requirements is also an antecedent to production planning and scheduling as this addresses the capability to supply inventory required to meet customers' demands. Without availability of inventory, production cannot be planned for (Aktepe, Ersoz, & Toklu, 2015:99). Yang *et al* (2017:680) argue that one positive factor to the process of production planning is the result of shorter delivery lead time. This is due to the pre-planned material required, planned production run and run duration as well as the quantity required. Organisations can then ensure that products are delivered JIT or earlier, provided there are no bottlenecks in the factory, thus, making shorter delivery lead time a dimension to production planning.

The basis of an organisation attaining a competitive advantage stems from its ability to differentiate itself from competitors through value, greater quality or through operating at low costs, which filter through to the customer. Productivity advantage can be attained through lower costs and efficient operations and can thus be considered an antecedent and a dimension to production planning (Schlegel & Trent, 2015:63). Production planning directly impacts the business performance through incorporating the businesses available resources, customer demands and machinery capacity to ensure goods are received by customers in time, thus making production planning an antecedent to production performance (Ehma *et al*, 2016:585).

2.9.2 The measurements of production planning

The concept of production planning has been extensively researched and measured by various academics and researchers who have proven the necessity of this variable in any manufacturing organisation. These include authors like Takahashin *et al* (2015:110) who used four items to measure the relationship between production planning and decision making in an organisation. Mifdal *et al* (2015:3) measured production planning in a multiple product manufacturing system using four items, while Seyedhosseini and Ghoreyshi (2014:9) and Sharma and Balodiya (2013:43) conducted a study integrating production planning and distribution planning in relation to time performance. This was conducted using three items. This study measured the effect of production planning using a five-point Likert scale (Sharma *et al*, 2013:3).

2.10 PRODUCTION SCHEDULING

Production scheduling serves to boost production planning and control in a manufacturing process (Yang, Ma & Wu, 2016:322). It brings about smooth work flow throughout the production cycle, prevents conflicts and delays in the use of productive resources and determines the expected time for the arrival of supplies and the shipping of finished products at minimum costs. However, Wu *et al (*2017:149) state that production scheduling merely looks at aligning the allocated job sequence problems, job production size, machine capacity and order size.

Production scheduling refers to plans that state when certain controllable activities should take place. It is the activity of allocating a firm's resources, such as the workforce, machines, vehicles, materials and the tasks to be executed within a certain period in the production of goods and services (Fera, Macchiaroli, Fruggiero & Lambiase, 2020:409).

This study adopted the definition of Yang *et al* (2016:322), which states that production scheduling serves to boost production planning and control in a manufacturing process.

2.10.1 The notion of production scheduling

The basis of production scheduling involves detailing the processing sequence of each item being produced and identifying the assembly centres and capacity as well as load required for each activity in the workshop (Kumar *et al*, 2019:3). The process and flow of production scheduling must be designed effectively in order to encompass elements involved in the detailed scheduling and control of production jobs. This involves preparing production schedules as well as resources required for all machinery, managing and reviewing the production plan to determine job release points and putting together paperwork such as job releases and tool requests (Rao *et al*, 2020:94).

The difference between production planning and production scheduling is that planning takes the material requisition plan, customer orders and material production to draw a production plan that will ensure that customers' orders will be ready on time (Keller *et al,* 2015:158). Production scheduling focuses on executing the production plan and converting work orders once they have an execution time period allocated to them. Its function is to boost production planning and control for improved performance (Hulse, Silva, Camponogara, Rosa, Vieira & Teixeira, 2020:23). Mabert *et al* (1982: 255) postulated that scheduling can be identified as the process of allocating jobs to various machinery while adhering to specific time frames and ensuring control over the movement of products and material components throughout the manufacturing plant. Labour must be coordinated, as well, at all assembly points in order for production to take place.

Production scheduling looks at aligning the allocated job sequence problems, job production size, machine capacity and order size requested. It also pertains to establishing the timing of the use of specific resources in a firm (Wu *et al*, 2017:151). This relates with the overall production scheduling plan for the production process within some given period to give an idea to management as to what quantity of materials and other resources are to be procured and when, so that the total cost of operations of the organisation is kept to the minimum over the period (Mostafa, 2020:990). Scheduling is an important aspect of operations control in both manufacturing and service firms with increased emphasis on output levels, lead time in meeting demand and in satisfying the customer (Yang *et al,* 2016:328). Production scheduling has been found to positively influence business performance in manufacturing firms, which in turn means production scheduling is a dimension of production planning and an antecedent of business performance (Ehma *et al*, 2016:588).

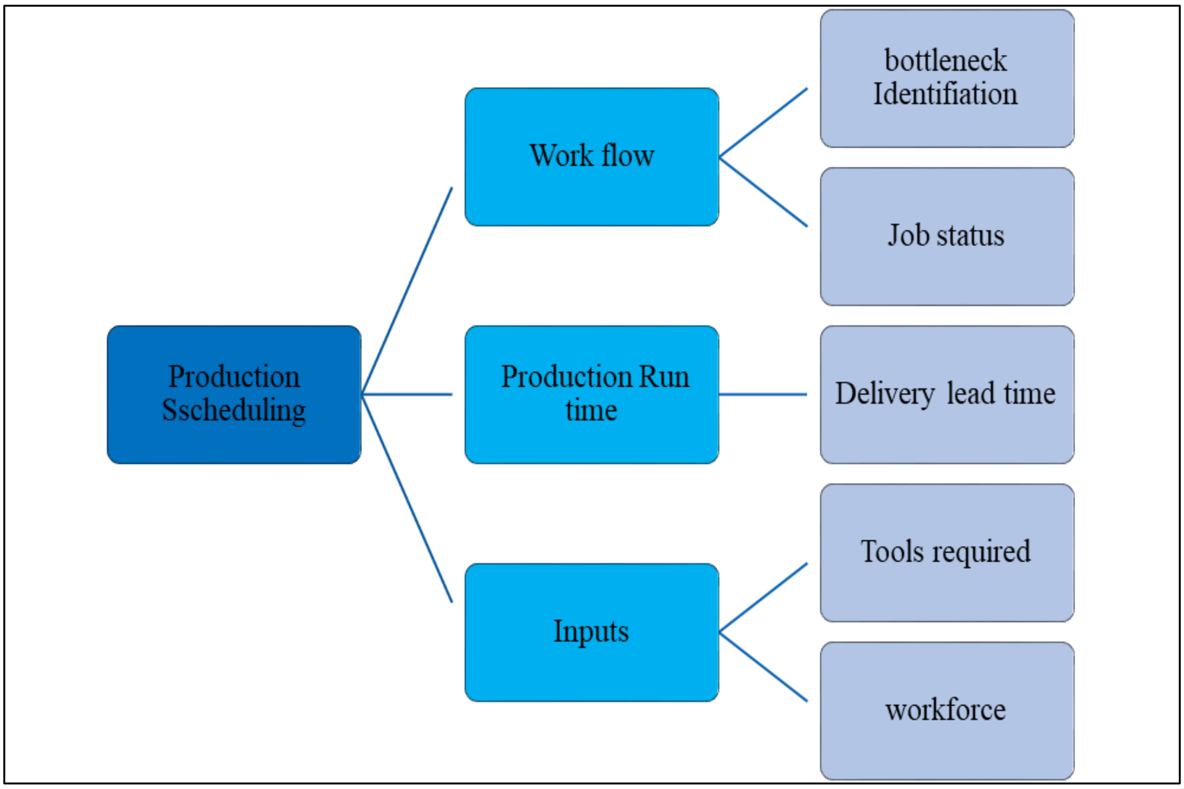

Figure 2.4: Process of production scheduling

Source: Developed by researcher

Figure 2.4 shows the efficiency and benefits that production scheduling provides. The process aligns the manufacturing workflow in order to eliminate production bottlenecks and creates transparency in the job production status. The production scheduling process details the estimated production run time to ensure that the required delivery time will be met. This process flow takes into consideration the required inputs for the job prior to the production run, which includes the tools and equipment required as well as the labour workforce to complete the job. These are all vital components to ensure that the production plan is executed efficiently.

2.10.2 The measurements of production scheduling

A number of researchers have conducted studies to measure the notion of production scheduling, for example Keller, Schonborn and Reinhart (2015:158) who measured energy driven machine loading for a cross-breed shop floor using six items. Furthermore, Yang, Ma and Wu (2016:322) evaluated the concept of production scheduling and its performance using four items and De-Snoo *et al* (2011:1357) developed a five-point Likert scale, which was adopted for the purpose of this study.

2.11 DELIVERY LEAD TIME

Delivery lead time is the organisation's response time from the time that the customer places an order, through production of the order and finally delivery to customer (Jayaswal *et al*, 2016:2792). Cannella *et al* (2017:125) describe lead time as the time between customers placing their order to the point of receiving their order. Planned lead time refers to the planned time between the production order completion date and the order release date to customers.

Delivery lead time refers to the time allocated to complete each job at the production workstation (Yuan *et al*, 2016:6106). This study further state that the time allocated to complete a job is always longer than required because it includes a buffer time to counter delays and enhance production planning flexibility. This study used the definition of Cannella *et al* (2017:125).

2.11.1 The notion of delivery lead time

Delivery lead time is widely considered to be a key measurement of service quality along with JIT which significantly influences consumers' relationship with companies (Yang *et al*, 2017:677). This pays back to the business performance through greater production flexibility and greater customer satisfaction.

Lead time is positively associated with business performance because of customer satisfaction through which the placing and receiving of orders are satisfactory to the consumers (Wang *et al*, 2015:220). Jayaswal *et al* (2016:2799) identified that changing lead-time on inbound logistics impact performance in a supply chain environment. The JIT theory aims to minimise product defects, through simplifying the production processes (Lagos, Boland & Savelsbergh, 2020: 38). This looks at the extent to which a firm can produce the required order quantity from customers, in the shortest time, without building inventory in the warehouses. The achievement of shorter delivery lead time positively contributes to the product quality, improved sales and improved manufacturing performance (Vranakis *et al*, 2014:338).

Customer satisfaction and customer loyalty are seen as variables that have a direct impact on the delivery lead time, customer's perceived value as well as the business performance. According to Strauss, Gulpinar and Zheng (2020:15), customer satisfaction comes when the customers' expectations towards a particular product are exceeded. Highly satisfied customers regularly defect to the competition. On the other hand, Mullins, Ahearne, Lam, Hall and

Boichuk (2014:1) define customer loyalty as a deeply held commitment to re-buy or re-patronise a preferred product consistently in the future. Yang *et al* (2017:680) suggest that a longer delivery lead time results in huge sales losses in manufacturing organisations when delivery dates are changed due to uncertain events on the factory floor that affect businesses performance.

Research has found that higher customer satisfaction leads to increased cash flow, revenue growth, profitability, market share and stock price and these result in an overall better performance for the business (William *et al*, 2015:1839). Thus, customer satisfaction is regarded as an antecedent to business performance, first to market and customer perceived value and one of the dimensions to delivery lead time.

Service quality which is defined as a comprehensive concept concerned with punctuality and on time variation in service, should be considered as an antecedent to delivery lead time. Service quality should perhaps be seen as the biggest reason for customers feeling that service quality consistency is more important than the transaction price (Aktepe *et al*, 2015:97).

The ability of a business to deliver value added interactive services to customers seems to be increasingly important in gaining a competitive advantage edge by strengthening relationships with customers (Strauss *et al*, *2*020:21).

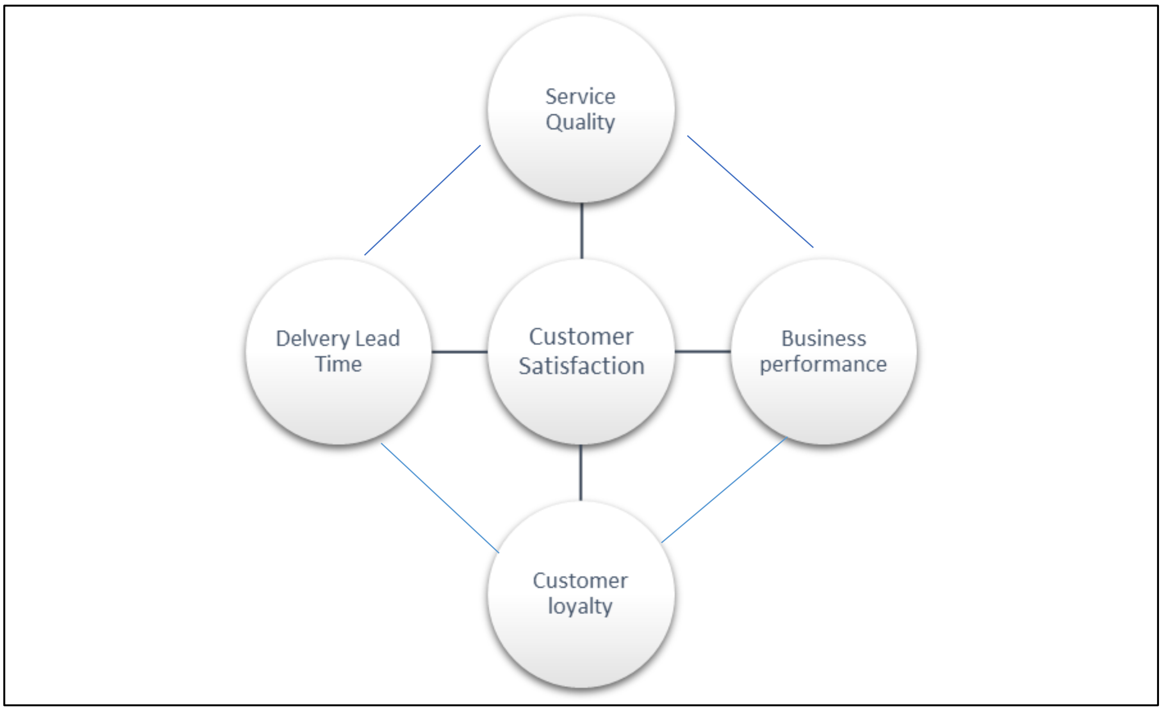

Figure 2.5: Outcomes of delivery lead-time

Source: Developed by researcher

Figure 2.5 depicts the advantages that come with focusing on delivery lead time as a means to improve business performance. Delivery lead time directly influences the service quality perceived by customers and this increases customer satisfaction and customer loyalty to the brand. All these variables positively affect and increase business performance and reliability.

2.11.2 The measurements of delivery lead time

The notion of delivery lead time has been widely measured by various authors researching the impact thereof in multiple disciplines. Yuan *et al* (2016:6106) conducted a study looking into setting optimal job sizes and planned delivery lead time in manufacturing. Samaranayake (2013:4499) measured the improving delivery lead time using production planning as a lead time reduction tool. Menachof *et al (*2009:352) developed a five-point Likert scale to measure delivery lead time and this was used in this study.

2.12 FIRST TO MARKET

First to market entry is a strategic advantage that allows firms to build market-specific reputations, signal market understanding and commitment and create switching costs for clients within a specific market (Nam, Lee & Lee 2019:6). First mover or first to market is when a firm is able to penetrate a market before their competitors. The first to market advantage exists if firms are better off on average than their competitors because of being first to market in a new product category (Hietala, 2017:2). First to market or early market entrants, according to Wang *et al* (2016:199), is when an organisation is able to penetrate a specific market faster than their competitors which assists these organisations to gain higher customer share.

2.12.1 The notion of first to market

First to market firms can gain sustainable competitive advantage and create a barrier for new entrants into the market. There are risks involved such as failing to keep and grow their customer share and losing to the opposition (Gossé, Hoffreumon, Zeebroeck & Bughin, 2020:12). Market entry timing is a critical strategic decision that firms entering new markets have to take. If done correctly, these firms can establish strong resource position barriers for their competitors that ultimately leads to business performance (Hietala, 2017:4).

Previous researchers have shown that order of entry significantly affects the firm's performance in the market and it was noted that first mover advantages were ultimately asymmetries between the core competitors in a market (Robinson & Fornell, 1985:128; Lambkin, 1992:256). Powell (2014:40) suggests that early entrants (pioneers) enjoy enduring competitive advantages over followers (early followers and later entrants) which translates into a higher level of market share and profitability.

For businesses to adapt to external threats, it requires resourcefulness, creativity and innovation. Without direct continuous innovation and improvement to the plant, manufacturing organisations cannot remain competitive (Oni, Agbobli & Iwu, 2019:65). Innovations reflect a critical way in which a business responds to market challenges and the need of the market is to deliver high quality products through continuous changing in features in product, improving existing products, reducing their cost and improving employee skills and training. This ultimately leads to a better performance for the business (Nanda *et al*, 2015:389).

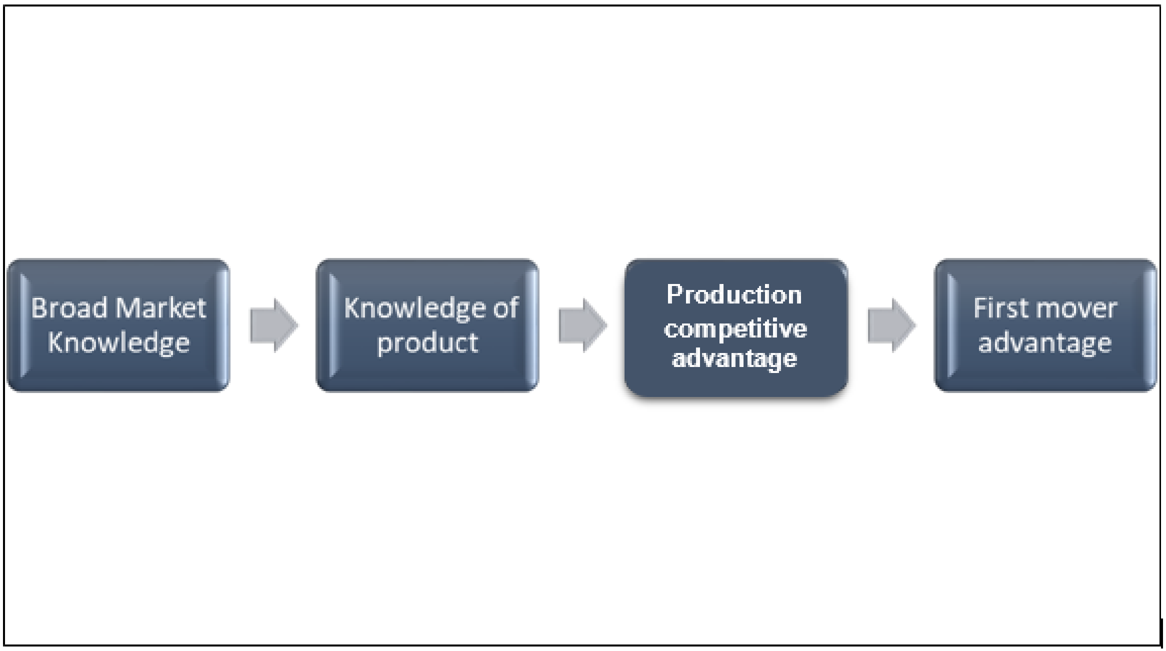

Figure 2.6: First mover competitive performance

Source: Pehrsson and Rollins (2018: 4032)

Figure 2.6 illustrates the requirements for a company to achieve the first mover advantage. This process flow signifies the importance of a research and development department to identify market requirements. It is important to identify the need of target market and an understanding of how to fulfil that need. It is important to detail the product specification and functionality in order to fulfil the need before the competition.

Businesses must use every opportunity of interacting with their customers to acquire customer knowledge and improve their customer knowledge database in order to create new value for the customers, thus making customer knowledge a dimension as well as an antecedent to the first to market variable (Tseng, 2016:203).

Knowledge management allows the interaction of people, technologies, processes and strategies within the firm to create and share knowledge, which makes it an antecedent to first to market because if knowledge is not shared between business units, it could pose as a bottleneck in production performance (Reine, 2015:73).

Service quality has become much more significant as a means of attracting and retaining customers. Service quality is determined by the customer once the product or service is in the market, thus making service quality both an antecedent as well as a dimension to first to market experience (Tseng, 2016:202).

2.12.2 The measurements of first to market

Various academics have conducted research to unpack this variable in multiple disciplines, such as Powell (2014:43), who conducted a study relating to the relationship between business profitability and speed to market. This author developed a five-point Likert scale which was adopted from Chen and Hsu (2009:350).Hietala (2017:2) used four items to measure advantages and disadvantages to first mover markets, while Lakhal (2009:645) developed a five-point Likert scale to measure first to market efficiency, which will be adopted for this study

2.13 BUSINESS PERFORMANCE

Business performance is improvement in a company's popularity, profitability and marketing, sales increase and increased product development (Vranakis *et al,* 2014:345). Business performance can be assessed by looking at the organisations production efficiency, service delivery and staff productivity (Muhonen *et al,* 2017:55). Reine (2015:78) states that business performance refers to an equal balance of organisational costs, manufacturing flexibility, quality and dependability. According to Dametew *et al* (2019:27), numerous approaches have been proposed to improve firm performance, such as total quality management which entails management's overall viewpoint that seeks to incorporate all organisational functions. This put emphasis on aligning customer requirements and organisational objectives. Through this approach, both employees and management can be actively involved in continuous development and delivery of the final product (Hamoud *et al*, 2016:50).

2.13.1 The notion of business performance

If businesses can consistently provide their customers with the desired quality and quantity of the products demanded at an acceptable price, this may assist the business in gaining a competitive advantage over their competitors (Pham, 2020:730). For a business to be successful over a long period of time, the business must have an internal foundation and management over their operations in order for inbound and outbound movement to run smoothly (Williams *et al*, 2015:3).

One of a manager's toughest and most important responsibilities is to evaluate the performance of their business and this is done through performance appraisal (Tokola *et al*, 2016:620). The selection of the suitable strategy cannot bring the desired results by itself (Vranakis *et al,* 2014:337).

In the past few years, a vast amount of theories has been developed regarding the improvement of a firms' operational performance (Bianchi *et al*, 2017:180). Aligning production planning capabilities can enhance the firm's progression and successful pursuit of opportunities to achieve international performance outcomes (Nanda *et al*, 2015:389). In particular, the enhancement of the manufactured product quality, direct response to market demands, the minimal delay on the firm's behalf and, of course, the minimal production cost have been emphasised (Vranakis *et al*, 2014:339). Businesses that want to grow have to adapt to the rapidly changing environment through continuous innovation to develop new products in order to reach new customers (Pham, 2020:723).

Businesses management is an antecedent of performance because the strength of the management team is important as they have the ability to make decisions that can build or break the business. A business needs a manager who has exceptionally intellectual horsepower and who understands the nature of the competition and what will be required to win (Peng & Beamish, 2016:1506).

This study looked at trust as an antecedent of business through referring to Bagshaw (2014:12), who defined trust as a key ingredient for the development of long-term business and a highly significant tool for enhancing inter-firm relationships. Trust is developed through continuous exchange of information between business units in the organisation which reduces uncertainty and, in this way, trust can influence the future working relationships of all departments or business units within an organisation (Nguyen *et al*, 2020:70).

Customer perceived value is a function of quality and price. It enhances repurchase intention and discourages switching behaviour. There are customers who equate value with price, this is usually the case when goods are perceived to have uniformed or homogenous levels of output the cheapest goods are seen as the most valuable (Muturi *et al*, 2014:323).

The role played by the perceived value on business performance directly results in an assessment of whether a seller's price can be reasonably justified and a price paid higher than other customers is likely to be perceived as less fair (Kharim *et al*, 2014:189). Thus, customer perceived value is a dimension to business performance.

Based on the nature of the complexity and the nature of the long-term supplier- customer interaction, it is expected that the quality of the relationship plays an important role in influencing the performance success criteria of a business. The quality of the relationship is seen as both an antecedent of delivery lead time and business performance and a mediator between first to market and business performance (William *et al*, 2015:1837).

It is important to fully understand the competencies of each unit and their strengths, weaknesses, expectations and values to build a productive and positive relationships amongst organisations, making relationship building an antecedent of business performance (Nguyen *et al*, 2020:71). Reine (2015: 77) defines collaboration as a cross unit which takes place when people from different units work together in cross unit teams on a common task to provide significant help to each other for a better output. This factor also serves as an antecedent of business performance. Collaboration within business units leads to better innovation which happens because people from different areas, business units, divisions, technology centres and sales offices come together to create new ideas through these interactions and go on to develop exciting products (Reine, 2015: 73).

2.13.2 The measurements of business performance

There has been extensive research and studies conducted on this variable through multiple disciplines, for example Tokola *et al* (2016:620) conducted a survey measuring key performance indicators in manufacturing and this was done through the use of a five-point Likert scale. Liao, Wu and Chou (2016:4280) and Vranakis *et al* (2014:339) measured key success factors in manufacturing industry through developing a four-point Likert scale. Uma *et al* (2017:26) developed a five-point Likert scale to measure the effect of customer's satisfaction on business performance which will be used in this study to measure business performance.

2.14 HYPOTHESES DEVELOPMENT

The purpose of this section is to provide the framework of the study and research topic. Each research variable is illustrated and the relationship between the various variables stated. This concept consists of one predictor variable, which is production planning, three mediator variables which are production scheduling, delivery lead time and first to market and finally, one outcome which is business performance. The conceptual model is presented in figure 2.7.

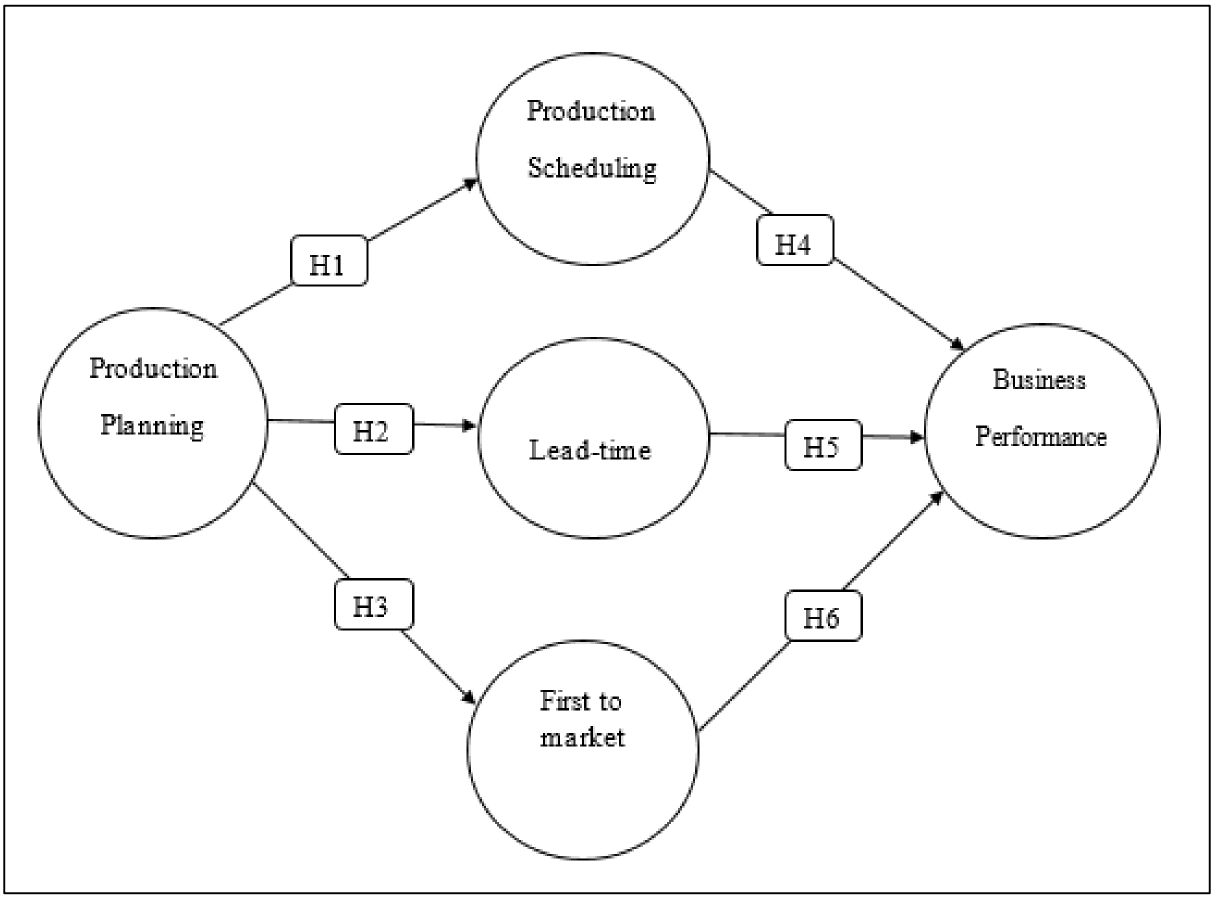

Figure 2.7: Conceptual model

2.14.1 Hypothesis statement development

This section explains Figure 2.6.

2.14.1.1 Production planning and production scheduling

Production planning is regarded as an effective factor which facilitates cooperation in the manufacturing process (Dametew *et al*, 2019:23). Various researchers have conducted studies affirming the correlation between production planning and production scheduling, for example Kloock (1969:29), who distinguished the difference between production planning and production scheduling and measured the effectiveness of both notions being aligned. Gomez, Lanzolla and Maicas (2016:271) highlighted the importance of knowledge shared between the production plan and production schedule stating that this leads to optimum production flow. Nikolic *et al* (2017:798) found that the process of production planning remains a prerequisite for scheduling because it enables production jobs to be carried out smoothly on the shop floor, identifying and eliminating bottlenecks.

Production planning is a crucial part of any manufacturing system; it outlines required raw materials and provides a layout for the production schedule, therefore production scheduling as a link between the process plan and the execution thereof (Barzanji *et al*, 2019:12). The production theories provided by Kloock (1969:29) are supported by Fera *et al* (2020:410), stating that production scheduling arises in the manufacturing plant as a result of a production plan. Yang *et al* (2017:680) state that the positive factor in the process of production scheduling is a result of a production plan which details the material required, production duration as well as the quantity required. Yan, Li and Wei (2018:554) suggest that the processes of production planning and scheduling coexist and that the function of one cannot be executed without the other. Based on this evidence, it can be deduced that production planning influences production scheduling positively, leading to the following hypothesises:

H1: Production planning positively influences production scheduling within the manufacturing industry.

2.14.1.2 Production planning and delivery lead time

Delivery lead time is a component that frames the production process flow regarding work in process time, waiting time per operation and expected delivery date (Wang & Jiang, 2017:3). Manufacturing organisations plan and produce products based on job size and required delivery date, by means of various production methods (Plenert, 1993:258). According to a study conducted by Ehma *et al* (2016:585), one of the concerns in manufacturing, which is addressed by production planning, is ensuring that the organisation meets customers' demands on time by planning jobs in such a way that the delivery lead time is reduced. Hulse *et al* (2020:17) agree with this notion by emphasising that production planning takes delivery lead time into consideration to establish the best method for production to be executed. Some manufacturing companies will for example use event-based production planning which works to reduce manufacturing costs by adhering and scheduling production jobs on the basis of the delivery date (Pielmeier, Theumer, Schutter, Sonyman, Bessdo, Braunreuther & Reinhard, 2019:374).

The customers' expected service delivery time is often smaller than the total production time, thus, the customers' demand should be anticipated through a forecast and planned for in the master production plan to ensure the required service is delivered on time (Brunaud *et al,* 2019:100). Cannella *et al* (2017:125) state that in order for an organisation to minimise or meet the required delivery lead time, it is imperative for the production plan to ensure that all required materials, equipment and resources are available to produce products effectively at zero waste and reduced production time. In a study by Yang *et al* (2017:680), the findings suggest that a considerably positive factor to production planning is the outcome of shorter delivery lead time, thus, inferring from this literature and empirical evidence, the current study's second hypothesis is:

H2: Production planning positively influences delivery lead time of goods in the manufacturing industry.

2.14.1.3 Production planning and first to market

Production planning can be considered one of the most vital functions in any manufacturing organisation because if executed effectively, it can have benefits that reach far beyond expectation, one being first mover advantage (Hietala, 2017:17). While Aktepe *et al* (2015:97) assert that production planning can actively reach new customers through planning production with the use of marketing strategies to ensure the organisation is the first gain market share

(Feng *et al,* 2018:26). The function of production planning is crucial for an organisation aiming to attain the first mover advantage. With the aid of marketing research planning, an organisation can ensure that products reach consumers before a competitor is able to produce a similar product.

An organisation must have customer knowledge to ensure that the products being manufactured are required by the customers and the production plan ensures that the products are manufactured at the right time, in the right quality and right quantity and can potentially secure the first to market advantage for the organisation (Tseng, 2016:203). According to Poelmans, Raisanen and Taylor (2019:5), for a manufacturing firm to succeed in attaining first mover advantage, it is necessary for the required products to be produced at the right time, right quantity and right quality and this must be accounted for in the production plan. The production plan ensures that products are produced in a timely manner for the organisation to attain market share. This being the case, this study's third hypothesis is:

H3: Production planning positively affects first to market activities within the manufacturing industry.

2.14.1.4 Production scheduling and business performance

Production scheduling actively contributes to the overall performance of business performance through efficiently allocating resources and workforce during production (Bagshaw, 2014:6). Rao *et al* (2020:94) second this by proving that production scheduling can lead to improved manufacturing performance. Furthermore, researchers like Ehma *et al* (2016:588) highlight the importance of using production scheduling as a lean manufacturing tool to better execute production at zero waste as a means to improve business performance. Organisations that collaborate factory floor activities to ensure continuous and efficient flow of jobs result in better manufacturing performance with minimal cost incurred (Kumar *et al,* 2019:5).

Production scheduling is a vital function in manufacturing as this heightens control in the factory, ensures continuous flow of work, prevents bottlenecks and thus improves the overall business performance (Yang *et al,* 2016:322). All this empirical evidence proves that there is a link between production scheduling and business performance, thus, the following hypothesis was developed:

H4: There is a positive relationship between production scheduling and business performance.

2.14.1.5 Delivery lead time and business performance

Delivery lead times directly impact the organisation's performance through customer satisfaction and service delivery (Fraering & Minor, 2013:334). Yuan *et al* (2016:6106) identified delivery lead time and service quality as two of the components required for an organisation to succeed. According to Pielmeier *et al* (2019:375), delayed or late delivery to the end user can result in the business incurring default penalties such as loss of profit and potential loss of customers. Mwalim, Egessa and Evans (2019:3) asserted that continuously reducing delivery lead time and ultimately increasing customer satisfaction can be a strategic approach to developing team capabilities and improving organisational performance.

In order for an organisation to succeed, one of the aspects which has to be performed, is service delivery, which Strauss *et al* (2020:31) regard as reduced delivery lead time. The impact that delivery lead time has on business performance has been researched in a number of studies such as Madankumar and Rajendran (2018:5), who emphasised that shorter delivery lead time positively affects business performance through customer satisfaction and customer returns. Lagos *et al* (2020: 41) established that reduced delivery lead time is a direct reflection of the performance of the organisation as a whole. This actively speaks to lean manufacturing and the efficiency of the organisation. According to Tripathi, Stanton, Strobino and Bartlett (2019:7), the inability for an organisation to meet 'customers' required delivery lead time creates supply uncertainty and supplier unreliability and this reflects poorly on the performance of the business. Based on this literature, the following hypothesis was developed:

H5: Delivery lead time positively affects business performance within the manufacturing industry.

2.14.1.6 First to market and business performance

The first to market advantage has been proven a strategic approach to acquire new customers, to retain existing customers and to improve the performance of businesses (Nanda *et al*, 2015:389; Tseng *et al*, 2019:110). The association of first to market has been found to be an important activity for firms due to its ability to attain a competitive advantage through brand awareness for the business. This interaction may well develop the necessary skills and technical know-how required to produce products that consumers want, thus creating a first mover advantage. A study by Hietala (2017:2) stipulates that an organisation that focuses on brand knowledge, market requirements and customer knowledge works towards ensuring that it (the organisation) is the first to penetrate the market and become successful, thus resulting in optimum business performance and relevance. Businesses can become the preferred brand or service provider when they are innovative and launch products before their competitors. This positively impacts the performance of the organisation (Wang *et al*, 2016:200). Feng *et al* (2018:4) state that the timing behind first to market entry is an important decision for any organisation. This decision should depend on the demand window and market growth rate from customers. First mover refers to an understanding of how your 'organisations' competitors perform, external environmental threats as well as an understanding of what consumers want and how to manufacture the products, all which play a role in an organisation's performance (Pham, 2020:725). Thus, the following hypothesis was formulated:

H6: There is a relationship between first to market and business performance.

2.15 CONCLUSION

The purpose of this chapter was to provide insight in the trends and structures in the manufacturing industry. The first section of the chapter provided a view of the global manufacturing industry versus the current state of the manufacturing industry in South Africa. The chapter detailed how far the manufacturing industry has come after the apartheid era, with the objective to identify the gap and provide opportunities for organisations to improve their manufacturing organisations. The second and third sections of this chapter show that the manufacturing sectors have seen some growth in the GDP although it is rather marginal; the challenges faced by the South African manufacturing industry has been the abundant supply of cheap products from countries such as China. The fourth section of the chapter focused on discussing the notion of the theory of production, the role, concepts, principles and processes associated with production planning, production scheduling, delivery lead time, first to market and business performance. Regarding these concepts, the literature showed that these concepts coexist and collaboratively contribute to the business' performance both directly and as secondary influencers. The chapter also cited measurements from previous studies and highlighted the relationship between the various variables. The next chapter discusses the method used for gathering and analysing data in this study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter discusses the research methodology employed to obtain sufficient and accurate information for this study. The chapter provides a background on accessible research theories and approaches which can be adopted. It begins with outlining the research philosophies and paradigms detailing the differences between the variables. Thereafter, the chapter describes the research approach and design adopted in the study as well as the research methodology used in the research study, focusing on the research method and design employed and the development and distribution of the questionnaires. This is followed by the data collection and preparation techniques employed in the study. Lastly, the chapter elaborates on the statistical methods used as well as pre-test, reliability and validity of the data gathered for the study. The chapter gives an understanding of the data collection approach adopted for this study as well as the structure of the questionnaire measurement items.

3.2 RESEARCH PHILOSOPHY

A research philosophy is the truth, reality and knowledge perceived by a study. This significantly shapes the values and beliefs that influence the data collection design and data analysis in the study (Gemma, 2018:41). Corry, Porter and McKenna (2018:2) define research philosophy as beliefs that bestow theoretical frameworks for conducting research and these beliefs relate to the nature of realities. The below section elaborates on the research philosophies that are vital in effectively executing research procedures. The idea of a paradigm is established from a study from Kuhn (1962:22) who depicts that judgement, standards, perspectives, theories, approved procedures and ideologies are perceived as valuable by individuals because they lead their thinking. This study unpacks the interpretative and positivism paradigms, which support qualitative and quantitative research in conjunction (Deetz,1996:193).

3.2.1 Positivism, interpretative and realism paradigms

The paradigm adopted in a study ensures that the reader is able to apply the suitable measure to determine the significance of the study (Guba & Lincoln, 1994:110). The three existing paradigms are explained next.

3.2.1.1 Interpretative paradigm

An interpretative paradigm is often consolidated with terminologies such as post-positivism, naturalistic paradigms, constructivism and qualitative research. This approach believes that people desire to mentally grasp the world they live in as a social construct (Dean, 2018:4). This approach entails creating meaning in social situations from individuals' experiences and relies on interviews or focus groups to attain knowledge from participants (Gemma, 2018:47).

3.2.1.2 Realism paradigm

Realism is the belief that reality is shaped by an individual's values. Over time, this can include political and cultural aspects (Gemma, 2018:42). Johnson, Russo and Schoonenboom (2019:145) assert that what we expose ourselves to and observe is reflected in our world as reality. In the realism paradigm, the study is directly influenced by individual perceptions and experiences which are drawn from external forces such as mass media, politics and culture (Corry *et al*, 2018:5).

3.2.1.3 Positivism paradigm

The development of positivism as a model entails the use and application of scientific methodologies to uncover various dynamics related to society and social problems (Corry *et al*, 2018:4). Johnston (1986:31) states that the positivism paradigm is concerned with attaining knowledge aligned with an existing objective reality, self-governed and independent of scrutiny waiting to be discovered. Mitchell (2018:107) considers positivism as solely a scientific approach to conducting research, as this paradigm draws facts based on scientific components to determine the effect of a scientific complication. Gemma (2018:45) argues that positivism assumes that a reality can be determined through a systematic approach to advance and create objective knowledge. Due to the fact that positivism employs scientific methods to test and discover dynamics in social constraints, this approach was adopted for purposes of this study.

3.3 RESEARCH APPROACH

A research approach is defined as a set out proposal, which details the method to be followed for conducting research. A research approach is important in research because it outlines the structure that will be followed when collecting and analysing data, as well as the method of data interpretation (Lavena *et al*, 2020: 493). There are three major approaches in research, namely qualitative, quantitative and mixed methods.

A qualitative research approach is able to reach individuals who are less likely to volunteer for interviews that may reveal their opinions (Kirkman, Bourne, Fisher, Johnson & Hammarberg, 2014:735). Researchers would invite and encourage people to attend focus groups to talk through their reflections on certain experiences related to the study in question. During the discussion, participants freely state their opinion, thus, building trust in the group (Lavena *et al*, 2020: 499).

A quantitative approach includes pre-structured formalised principles which form the basis for a stringent research process that is derived from formulated research questions, a research design, the selection and analysis of data, interpretation and conclusions (Lavena *et al,* 2020: 498). A quantitative approach is characterised by stringent requirements for structure, which provides flexibility.

A mixed method approach combines all research approaches to unpack and realise the research problem. This method uses pragmatic knowledge claims, which consider peoples decision making in real world situations and consider the consequences of actions. This approach employs concurrent strategies to join both quantitative and qualitative in order to provide an all-inclusive analysis (Creswell, 2014:240).

This study took on the quantitative approach to collect data, reason being the study aimed to evaluate and test the strength and relationship between dependent and independent variables. A quantitative approach was vital for this study because it employs measurement method, which was specific to the topic of interest.

3.4 RESEARCH DESIGN

Research design, as a tool, provides the structures for the data collection procedures as well as data analyses to be adopted for the study (Baker, 2015:40). Levitan *et al* (2018:225) describe research design as a process followed when conducting research and collecting data from the identified sample size. Additionally, Toong (2019:390) suggests that a research design is the method employed that details how data will be collected, measuring instruments to be used as well as the planned method of analysing collected data.

There are different types of quantitative research designs, namely longitudinal survey, experimental research, cross-sectional survey and comparative research (Mirabelli, Emanuela, Pawliszyn, & Renato, 2018:7). The present study was conducted using a cross-sectional survey design. A cross-sectional survey involves collection of data from a large group of respondents once in a period of time. These respondents usually have a particular set of interests in common (Gemma, 2018:42). This survey design was used in this study because it offers several benefits such as being fast and cost efficient, it allows for easy analysis of data and provides more accurate data (Baker, 2015:42).

3.4.1 Sampling design

A sample design refers to the proportion of the population of whom the study intends to describe the attitude and opinions through a systematic manner where all elements of the selected population can be included (Gaur *et al,* 2017:12). Sampling refers to drawing a few respondents derived from a bigger group to be the basis of estimates prevalence of the topic of interest (Bagshaw, 2014).

This section of the study will outline the target population which has being selected, the population of interest for the sample frame, the sample size of the study as well as the sampling designs and method which is adopted for this study.

3.4.1.1 Target population

Target population is defined as a group of individuals of whom the study intends to obtain information (Fidan & Tuncel, 2018:578). The targeted population refers to people who are specified by the research objectives in the study (Gaur & Kumar, 2017:5). Aziz, Jusoh, Wan-Idris, Hassan and Emran (2013:3) state that target population can also be defined as the type of person in the sample that is to be interviewed. In this study, the target population was composed of operation managers, production planners and supply chain practitioners in the manufacturing sector. Research does not entail studying the whole population in question, the study collects data from the target population (Leedy *et al,* 2014:212). These individuals were suitable as respondents for this study because they are involved in the day-to-day operations in the production plant and would benefit the most from the insight from the results of this study.

3.4.1.2 Sample frame

A sample frame refers to a descriptive list used to outline the population of interest for a study (Hamza & Kommers, 2018:19). It determines the set of elements within which the study draws a sample of the targeted population. A sample frame is a predefined set of information aimed at identifying a sample population for statistical analysis. This includes the characteristics of the individuals targeted (Fauzi & Pradipta, 2018:125). According to Zhang and Li (2013:280), the term sample frame is defined as a list that details the individual to be selected, including accurate information, which is to be used to obtain the selected individuals.

This study adopted the definition of Hamza and Kommers (2018:19), which describes sample frame as a descriptive list used to outline population of interest for a study. The sample frame determines the set of elements within which the study draws a sample of the targeted population. The sample frame used for this current study consisted of a list of manufacturing organisation in the Gauteng province (Briefly 2020:1).

3.4.1.3 Sample size

A sample size is the total number of sample units required to represent the predetermined target population of which the study will draw information from. According to Bagshaw (2014:11), the sample size is a number of individuals the study aims to draw information from for the purpose of a study and is dependent on the cost and time required. Oprea, Apostol, Bungau, Cioca, Samuel, Badea and Gaceu (2018:72) define the sample size as the amount of people the study requires information from.

This study adopted the definition of Bagshaw (2014:11) who states that sample size is the number of individuals the study aims to draw information from for the purpose of the study. The sample size is dependent on the cost and time required. Schmidt and Tawfik (2018:8) state that a sample size of 350 is regarded large enough to make a good representation of employees in the manufacturing sector. This study had a sample size of 300.

3.4.2 Sample method

There are two main types of sample designs. The probability sample method utilises a random selection of elements to reduce or eliminate sampling bias (Schmidt & Tawfik, 2018:7). Probability sampling includes simple random sampling, systematic probability sampling, stratified probability sampling and cluster probability sampling. The advantage of probability sampling is that each individual of the population is regarded to have zero chance of being selected as a sample. The population elements is most likely unknown (Farooq, 2013:2).

The second type of sample design is non-probability sampling which uses a subjective approach where certain elements in the population are more likely to be selected over others. Non-probability sampling includes convenience sampling, judgment sampling, snowball sampling and quota sampling (Gaur & Kumar, 2017:10). The current study adopted the probability sampling approach, using the random sampling method. Simple random sampling involves participants being chosen at chance. Each has a known and equal chance of being chosen for the study (Farooq, 2013:2).

In this study, the participants were selected in no particular order. The researcher selected one person per relevant department to participate in the study.

The study focused on the influence of production planning, production scheduling, delivery lead time and first to market on business performance in manufacturing industries. It has been observed that some manufacturing industries in the South Africa seem to underestimate the necessity of activities such as production planning. There also seems to be a lack of understanding of what production planning is with regard to how to use it to the advantage of the organisation and how to use this strategy to counter future production issues which may occur, such as late deliveries and poor quality products. This study sought to provide context to the identified gap.

3.4.2.1 Questionnaire design

Primary data collection was accomplished through a survey using a semi-structured questionnaire. A questionnaire is defined as a set of questions that a participant answers in an interview or a survey (Wright & Marsden, 2010:108). A questionnaire was chosen as the data collection instrument in this study because it aids in getting an unbiased response and is easy to analyse.

The questionnaire comprised of six sections. Section A comprised of the biographical data of the respondents, based on dichotomous and multiple-choice questions. Section B outlined questions on production planning. Section C showed questions on production scheduling. Section D consisted of questions on delivery lead time. Section E entailed questions on first to market. Lastly, Section F contained questions on the business performance of manufacturing firms.

Measurement items on production planning were adapted and used from previous research projects by Sharma and Balodiya (2013:43). Production scheduling items were adapted from De-Snoo *et al* (2011:1357), delivery lead time scale items were adapted from Menachof *et al* (2009:352) and first to market measurement items were adapted from Lakhal (2009:645).

Business performance questionnaire items were adapted from Uma *et al* (2017:26). Section B to F applied a five-point Likert scale with anchors ranging from (1) strongly disagree to (5) strongly agree to express the degree of agreement or disagreement. A Likert scale is a measuring scale which gives the respondents a rating of the level of agreement to disagreement on each question asked (Wright *et al*, 2010:110). The Likert scale was chosen for this study because it is considered to be appropriate for evaluating the response to the specific statement. All statements were rephrased to fit the context of the present study.

3.5 DATA COLLECTION TECHNIQUE

The concept of data collection embodies the process of gathering, analysing and measuring information related to a topic of interest. This information is gathered to provide insight, solve and answer a research problem as well as test the hypothesis and assess the outcome (Rahman *et al,* 2018:4).

This study made use of a self-administered questionnaire because it is more accurate and advantageous in terms of the circumstance where there is a respondent who do not understand one of the posed questions (Voltelen *et al,* 2018:521). There are various techniques or methods that could be used to collect data, namely postal data collection, telephone data collection, face-to-face data collection and shopping mall intercepts interviews. Physical distribution of questionnaires, namely the drop and collect method, was used to collect data by the researcher. Some questionnaires were distributed electronically to assist in minimising time allocated to collect data. The advantage of this method is that it increases the overall response rate. All the questionnaires were distributed and collected by the researcher over a period of three months.

3.6 DATA PREPARATION

Data preparation is a procedure in research where raw data are cleansed and transformed prior to conducting data analysis (Stieglitz, Mirbabaie, Ross & Neuberger, 2018:159). This significant process often involves realigning data and rectifying and merging data to enhance the outcome of the data (Snyder, 2019:24). Superior data preparation aids in logical data analysis, eliminates data defects and errors that can materialise during data processing and makes data understandable to reader.

3.6.1 Data coding using Excel spreadsheet

Data coding is the process of linking numerical data codes to theoretical codes. It allocates a number to each answer in the questionnaire (Csanadi, Eagan, Kollar, Shaffer & Fischer, 2018:429). The collected data is coded on an Excel spreadsheet prior to analysis. This process was used in this study to transform data into an understandable format.

3.6.2 Data editing

During the process of collecting data, information collected may lack consistency and must be sorted and edited. Data editing encompasses reviewing and adjusting collected data where necessary. This aids in controlling the quality and integrity of data collected (Sahil, Wongthongtham, Beheshthi & Zajabbari, 2019:520). During data editing in this study, accuracy, arranging of data and consistency of data in a systematic manner were checked thoroughly.

3.6.3 Data cleansing

Data cleansing is a procedure followed to ensure that data are consistent and accurate and can be used through identifying and eliminating any errors in data, isolating incorrect data and data with missing values to eliminate error readings (Snyder, 2019:25). In this study, data cleansing was applied to reduce data errors and model misspecifications.

3.7 DATA ANALYSIS AND STATISTICAL APPROACH

SPSS is the software package used for logical batched and non-batched statistical analysis (Stehlik & Babinec, 2017:2). It provides a novice user with an overwhelming amount of information and a broad range of options to analyse patterns in the data. Data was collected for this study was captured using Microsoft Excel spreadsheet and then later transferred to the SPSS. This software is used by various researchers for complex statistical data analysis. Descriptive statistics in the form of frequencies and means were used to examine the composition of the sample.

3.7.1 Descriptive analysis

Descriptive statistics is a tool and technique used to describe a feature employed in a study to provide a summary of the data collected (Rahman *et al*, 2018:5). Descriptive statistics include mean, mode, median, range, variance and standard deviation.

Descriptive statistics refer to the numbers used in a study to summarise and elaborate on the analysed data and information collected (Martins, Nunes, Nunes, Pechorro, Costa & Matos, 2018:78). Descriptive statistics is the method, which describes data collected from a study in a meaningful manner. This method was used to analyse the views and demographic profiles of the respondents.

3.7.2 Structural equation modelling (SEM)

Structural equation modelling is a family of statistical methods designed to test a conceptual or theoretical model. This study used Smart PLS statistical software (Garver & Mentzer, 1999:35). SEM refers to a combination of two aspects, namely a structural regression model, which links together latent variables and measurement models that define using more than one observed variable (Cheah, Memon, Chuah, Ting & Ramayah, 2018:140).

The SEM technique, which is used in behavioural sciences, is a combination of factor analysis and path analysis. SEM can be considered a theoretical construct, which is reflected by latent factors (Rahman *et al*, 2018:3).

This study tested the hypothesis with the use of the structural equation model using Smart PLS 3. This software was also used in the study of Letshaba and Chinomona (2019:13); Mugwenhi, Mafini and Chinomona (2019:82).

3.7.3 Path modelling

Path modelling can be viewed as a variance-based SEM technique, which describes the correlation between variables and theoretical constructs (Henseler *et al*, 2016:5). Path analysis enables the assessment of correlation between variables in accordance with their causal relationship and tests the structural path of the research model (Cheah *et al*, *2*018:149). Keith (2015:36) states that the responsibility of path modelling is to explain standardised regression coefficients and the predictive ability of variables.

For the purpose of this study, the Smart PLS 3 software was used to assess and verify the results of the hypothesis test and path modelling.

3.8 RELIABILITY AND VALIDITY

Reliability and validity of measurement is the degree to which the measurement instrument employed has no error. The approach to assess reliability is Cronbach's alpha coefficient and alternative forms (Robinson, 2018:745). Reliability can be identified as the extent to which a scale consistently produces results if repeated measurements are employed (Cheah *et al* *2*018:145).

Reliability and validity are concerned with the findings of research and relate to the credibility of the findings (Soelton *et al,* 2020:188). Reliability refers to continuous consistency of a measure. There are three types of consistencies in reliability, namely internal consistency, test-retested reliability and inter-rater reliability (Liu, De-Villiers, Ning, Rolfhus, Hutchings, Lee, Jiang, & Zhang, 2017: 599). Alhadi, Saputra and Supriyanto (2018:285) defined internal consistency measures as the consistency in participants' responses to questions in a multi-question measure. Questions using this measure aim to reflect alignment and correlation in participants' responses to a particular underlying construct. The reliability of instruments in the present study was assessed by conducting the Cronbach's alpha test.

There are various types of validities, such as content reliability, convergent validity, discriminate validity and criterion validity; however, the current study placed focus on content and criterion validity. Validity refers to the extent to which the instrument measures the variable it is intended to measure.

3.8.1 Content validity

Content validity refers to the degree to which a sample of items give a significant representative measure, concept and definition of a construct (Goktas *et al*, 2018 2356).

3.8.2 Convergent validity

Convergent validity is the extent to which two or more scales correlate to its related measurement items, in this measure, items are expected to relate to other measures in the same construct (Alhadi *et al*, 2018:285). In this study, convergent validity was assessed through observing inter-correlation between measurement items and the relevant research construct as well as using indicators such as item-to-total correlation values. The results are shown in Table 4.14.

3.8.3 Discriminant validity

Discriminant validity is the extent to which scores from a measure are distinct and do not correlate to other measures. Discriminate validity was measured in this study through observing the correlation matrix as well as the AVE results (Alhadi *et al*, 2018:285). The results are shown in Chapter 4, Table 4.14.

3.8.4 Criterion validity

Goktas *et al* (2018 2357) refer to criterion validity as the degree of which participants' feedback and scores on a particular measure correlate with other relevant variables. This test also looks at how one measure can significantly predict a particular outcome. The results are shown in Table 4.14.

3.8.5 Cronbach's alpha coefficient

The Cronbach's alpha coefficient values along with the correlation of unit total provide a positive relationship in this research, allowing the measurement items to be reliable and meet the required threshold (Cheah *et al*, 2018:140). Based on the results shared in Chapter 4, it is fair to say that most of the hypotheses have a strong relationship with each other.

The study used the Cronbach's alpha coefficient to assess its reliability. The values range between zero and one. The Cronbach's alpha coefficient states that if the alpha is between 0.51 to 0.60, it is moderately acceptable and if it is above 0.70, it is acceptable (Churchill, 1979:65). The results are shown in Chapter 4, Table 4.13.

3.9 ETHICAL CONSIDERATIONS

Ethics in research refers to the norms or standards that guide the research process (Arigo, Pagoto, Harris, Lillie, & Nebeker, 2018:7). It is mandatory that permission for the study be granted by the people or entities directly involved in the research (Copes, Tchoula, Brookman & Ragland, 2018:479). The importance of ethical consideration is to keep participants' information confidential to ensure that the study complies with acceptable and ethical behaviour (Voltelen *et al*, 2018:520). This study was guided by the following ethical principles during data collection.

3.9.1 Voluntary participation

The respondents of the study participated on a voluntary basis without any pressure being applied to them.

3.9.2 Avoidance of bias

Throughout this study, it was important to avoid biased data analysis and interpretation of the results.

3.9.3 Respondents' informed consent

The respondents were informed of the purpose of the study and the reason for honest feedback in answering the questionnaire for clean data collection (Barber, 2017:693).

3.9.4 Confidentiality and anonymity

The personal data of the respondents were processed fairly, lawfully and only used for the purpose of the study. Information security was complied with at all times (Copes *et al*, 2018:479).

3.9.5 Results transparency

The respondents were made aware that they could have access to the results once the study was completed.

3.10 CONCLUSION

The aim of this study was to assist manufacturing companies to demonstrate the necessity of production planning and how this affects business performance. This chapter began by describing the background of the research paradigm and the adopted research approach for this study. The second part of the chapter outlined the research design of the study, detailing the sample size, frame and sampling method. The third section described the questionnaire design of the study, which was conducted using a five-point Likert scale, whereby the manufacturing and supply chain personnel can improve their opinion and perceptions about the variables that influence their businesses performance. A five-point Likert scale ranges from strongly disagree to strongly agree, using a rating of 1 up to 5. This study used a self-administered questionnaire because they are more accurate, they provide immediate responses and the respondents were also able to ask questions when they seemed to misunderstand. This chapter showed that the sampling technique that was adopted is a simple random sampling, which is found under probability sampling and allows everyone a fair chance to take part in the study. Because the respondents' answers could not be accurate at all times, the technique adopted when collecting data was a face-to-face data collection method because the interviewer could then interact personally with the respondent. The reliability and validity measurement instrument were employed has no error, the results are shared in chapter 4. The last part of this chapter outlines the ethical considerations to show respondents participation is voluntary and their personal information is kept confidential.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION OF RESULTS

4.1 INTRODUCTION

The purpose with this chapter is to discuss the empirical results of the study. Discussing the results of the study is a crucial measurement of the validity of the study to ensure that the theoretical objectives and variables are aligned with the manufacturing industry practices and the study. In the first section, the descriptive factors are detailed by providing a background of the 306 respondents. The reliability and validity of the study follow. These results are verified through the Cronbach's alpha, composite reliability value and the AVE. The data in this study were analysed using the Smart PLS Software, which shows the influence of one variable on the other as well as the strength of the hypothesis. This chapter is the heart of the study because the respondents expressed how their manufacturing organisation is performing through answering the questionnaires.

4.2 DESCRIPTIVE STATISTICS RESULTS

The data were collected both physically and electronically. The questionnaires did not reveal the identity of the respondents and the anonymity of respondents was maintained throughout the study. Four-hundred questionnaires were distributed, 354 were retrieved and only 306 were eligible for analysis, which equates to 77% of respondents who participated in this study.

It is important for a study to begin by detailing the descriptive information or characteristics of the population sampled, for example demographics (Rahman, Abdul, Mansor, Ali, Samuela, Uddin, Ogiri & Rahaman, 2018:6). All data was collected and interpreted in a meaningful and understandable manner. Descriptive statistics include mean, mode, median, range, variance and standard deviation.

4.2.1 Respondents profile data

Section A details the general information on the background of the participants, namely gender, marital status, age group, race, language, industry and number of employees in the organisation.

4.2.1.1 Gender of respondents

The frequencies and percentages pertaining to the gender of respondents are illustrated in table 4.1.

Table 4.1: Gender of respondents

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Female	59	19.3	19.3	19.3
	Male	247	80.7	80.7	100.0
	Total	306	100.0	100.0	

Source: Developed by researcher

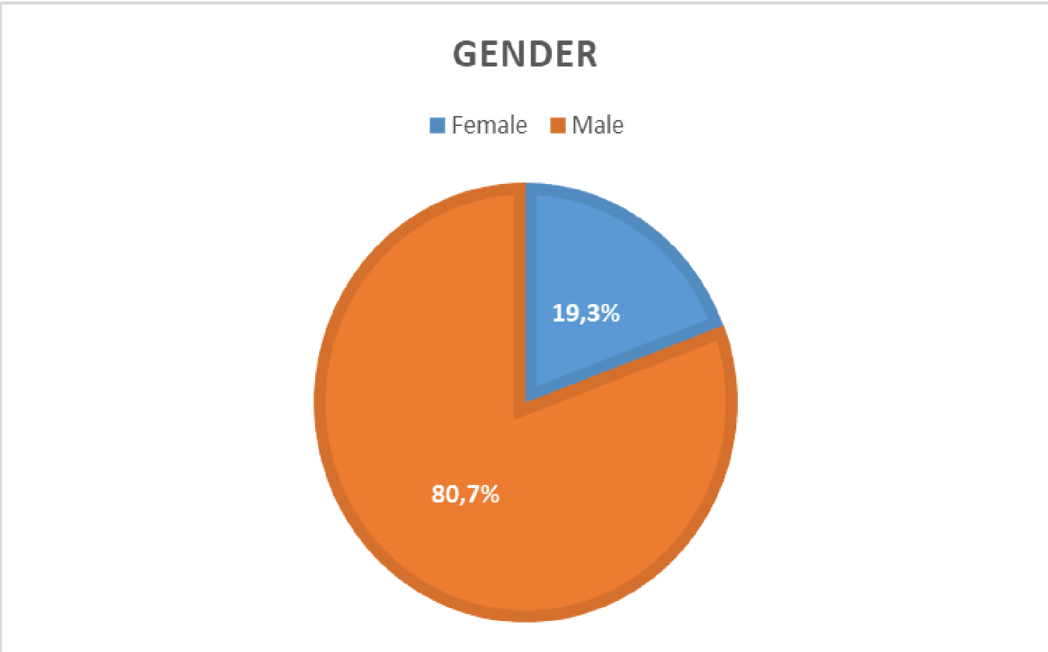

Figure 4.1: Gender of respondents

More and more industries are becoming more inclusive to women in the workplace, although manufacturing is still considered a male-dominated industry. An observation made from Table 4.1 is that male respondents were more dominant in the research study – 247 men participated in the study, accounting for 80.7 % while only 59 females participated in the study, which accounted for 19.3 %. The reason for this could be because previously, the manufacturing industry entailed physically-intense labour and longer working hours. Thus, it was more suitable for men to work in this industry than for women (Mwalim, Egessa & Evans, 2019:4). A different perspective could be because currently, women have more career options to choose from and the intensive labour related to the manufacturing industry is less appealing.

4.2.1.2 Marital status of the respondents

The frequencies and percentages pertaining to the marital status of respondents are illustrated below.

Table 4.2: Marital status of the respondents

Marital Status					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
	Divorced	36	11.8	11.8	11.8
	Engaged	28	9.2	9.2	20.9
	Married	144	47.1	47.1	68.0
	Single	85	27.8	27.8	95.8
	Widowed	13	4.2	4.2	100.0
	Total	306	100.0	100.0	

Source: Developed by researcher

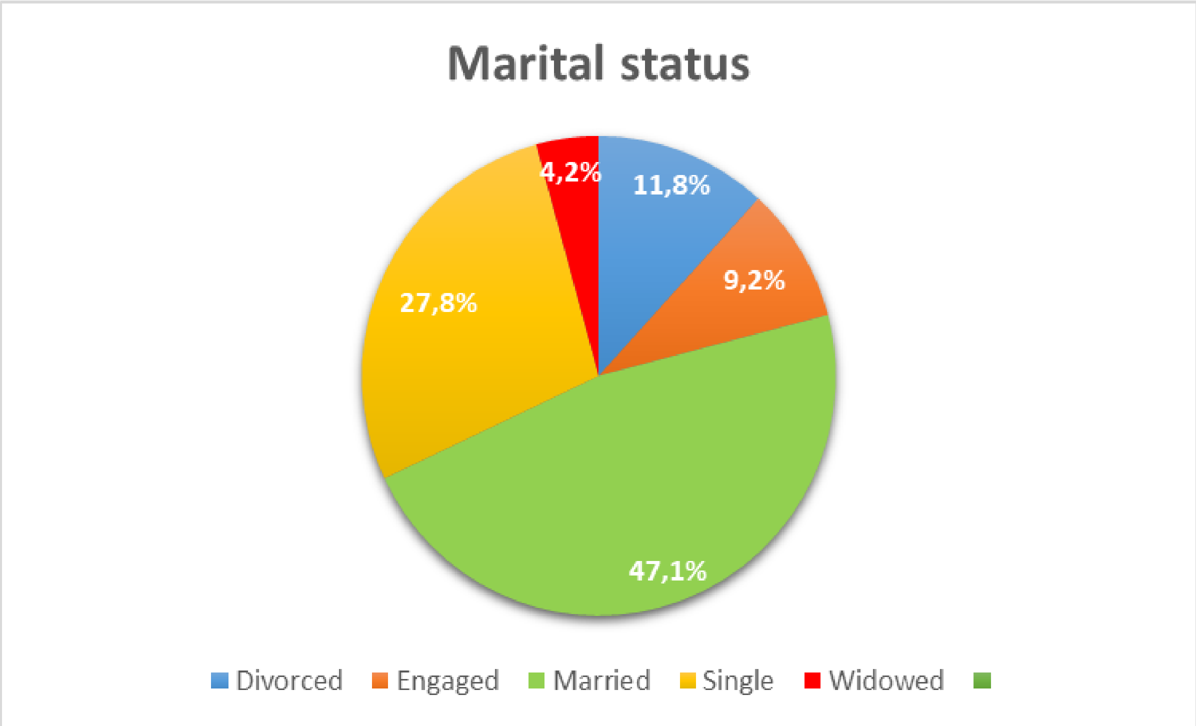

Figure 4.2: Marital status of the respondents

Table 4.2 shows that the majority of respondents working in the various industries were married. These respondents amounted to 144 out of 306 respondents, which made up 47.1 % of the total sample. This was followed by 85 respondents who were single constituting to 27.8 % of the sample. 36 of the respondents were divorced and they accounted to 11.8% of the total sample size. Engaged respondents constituted to 9.2% with a total of 28 respondents being in this category. Lastly, there were 13 respondents who were widowed and they accounted for a total percentage of 4.2%. The reason why the majority of respondents are married could be because most of the people in the working environment are an older generation and may be more settled in life. Another reason could be that once people start working. they tend to look for family stability in life or are under pressure to build families (Cheruiyot, 2017:45). The category with the lowest respondents was the widowed group. This could be aligned to the age group with older people who have lost their partners.

4.2.1.3 Age group of the respondents

The frequencies and percentages pertaining to the age group of respondents are illustrated below.

Table 4.3: Age group of the respondents

Age Group					
		Frequency	Percent	Valid Percent	Cumulative Percent
	< 25	27	8.8	8.8	8.8
	26 – 36	130	42.5	42.5	51.3
	37 – 47	77	25.2	25.2	76.5
	48 – 58	50	16.3	16.3	92.8
	59 – 69	22	7.2	7.2	100.0
	Total	306	100.0	100.0	

Source: Developed by researcher

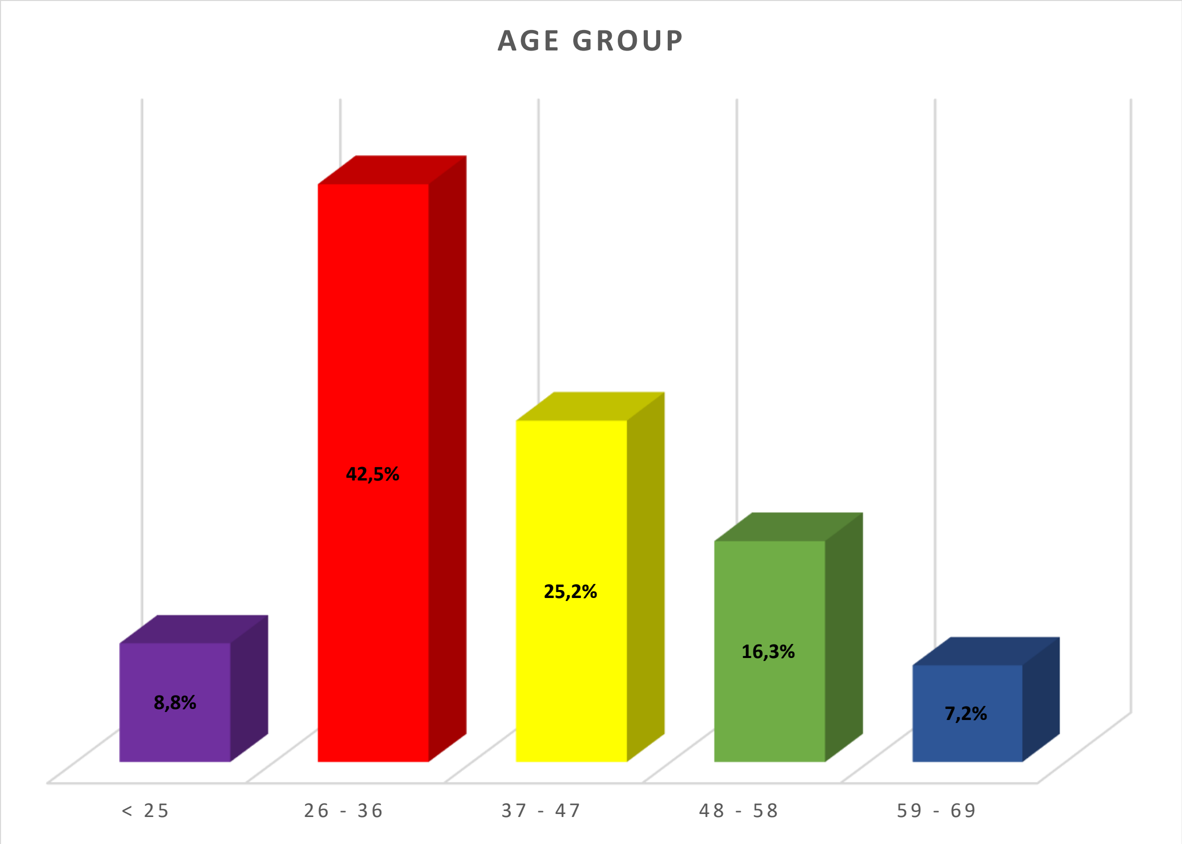

Figure 4.3: Age group of respondents

An observation made from Table 4.3 is that out of 306 respondents. 27 were younger than 25, which totalled 8.8% and 130 of the respondents were between the age of 26 and 36, which totalled 42.5% and was the highest group out of the total sample size. 77 of the respondents were between the age of 37 and 47, which were the second highest at a total of 25.2% and 39 respondents were between the ages of 48 and 58, which totalled 16.3%, with only 50 respondents occupying this category. Lastly, 22 respondents were in the age group of 59-69 and they ranked the lowest at 7.2%. The reason why the age group of 26-36 occupied the highest percentage could be because the younger generation is increasingly entering the work environment. Another reason could be that organisations are hiring younger generations for fresh and innovative changes in the work environment. The reason for the age group of 59-69 being the lowest could be because older people are nowadays retiring at a younger age than previously.

4.2.1.4 Race of the respondents

The frequencies and percentages pertaining to the race of respondents are illustrated below.

Table 4.4: Race of the respondents

Race					
		Race	Percent	Valid Percent	Cumulative Percent
	Black	96	31.4	31.4	31.4
	Coloured	43	14.1	14.1	45.4
	Indian	68	22.2	22.2	67.6
	White	99	32.4	32.4	100.0
	Total	306	100.0	100.0	

Source: Developed by researcher

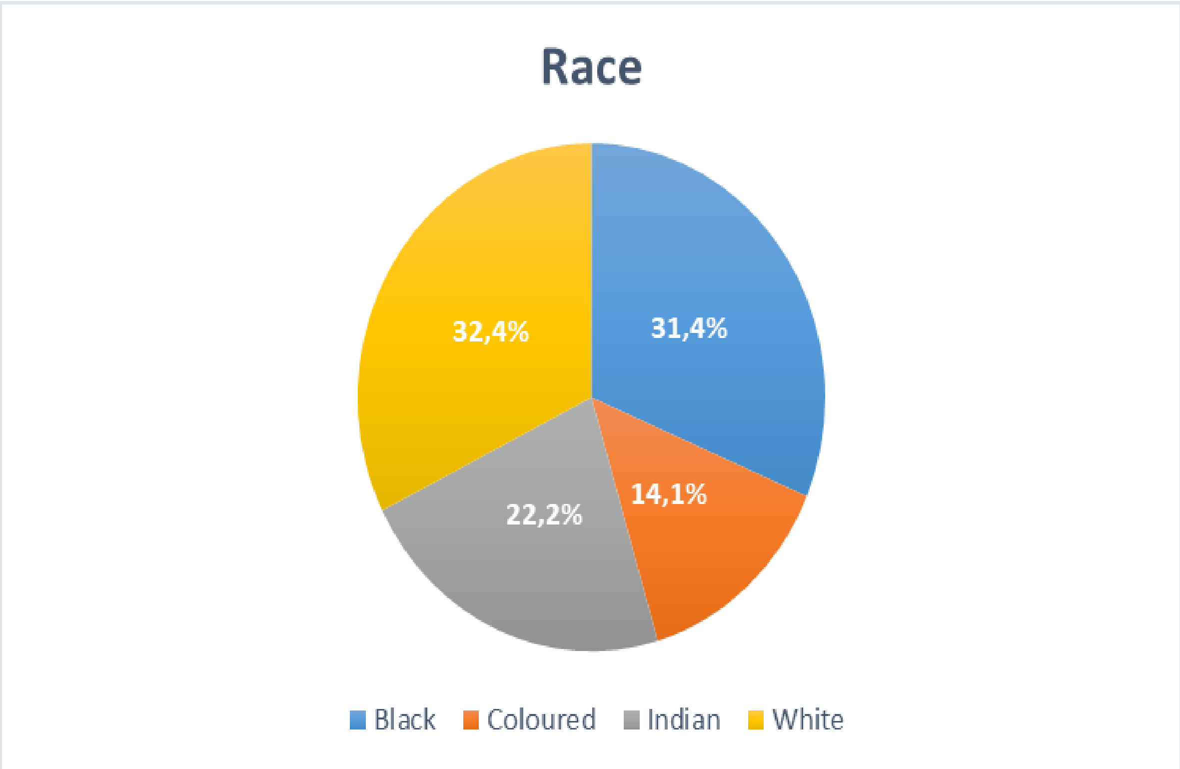

Figure 4.4: Race of the respondents

Based on information drawn from Table 4.4, the number of black respondents was 96 out of a total of 306 respondents, accounting for 31.4%, followed by the number of coloured respondents who totalled 43, which is only 14.1% of the sample size. The Indian respondents accounted for 22.2% of the sample with 68 respondents in this category. The highest percentage in this sample size was 32.4% with 99 white respondents in this category. A conclusion can be made that the race majority in the working environment is mostly occupied by white people, closely followed by black people. The reason for this could be that Broad Black Based Economic Empowerment transformation is becoming increasingly important for organisations, therefore, an equal balance of black and white employees is being hired. A different perspective could be that white people still have an advantage in the workplace due to the previous apartheid system, thus, some organisations still have white people dominating the company's head count.

4.2.1.5 Languages of the respondents

The frequencies and percentages pertaining to the home languages of respondents are illustrated in table 4.5

Table 4.5: Languages of the respondents

Languages					
		Languages	Percent	Valid Percent	Cumulative Percent
	Afrikaans	75	24.5	24.5	24.5
	English	134	43.8	43.8	68.3
	IsiNdebele	4	1.3	1.3	69.6
	IsiXhosa	3	1.0	1.0	70.6
	IsiZulu	15	4.9	4.9	75.5
	Sepedi	10	3.3	3.3	78.8
	Sesotho	14	4.6	4.6	83.3
	Setswana	28	9.2	9.2	92.5
	Tshivenda	10	3.3	3.3	95.8
	Xitsonga	13	4.2	4.2	100.0
	Total	306	100.0	100.0	

Source: Developed by researcher

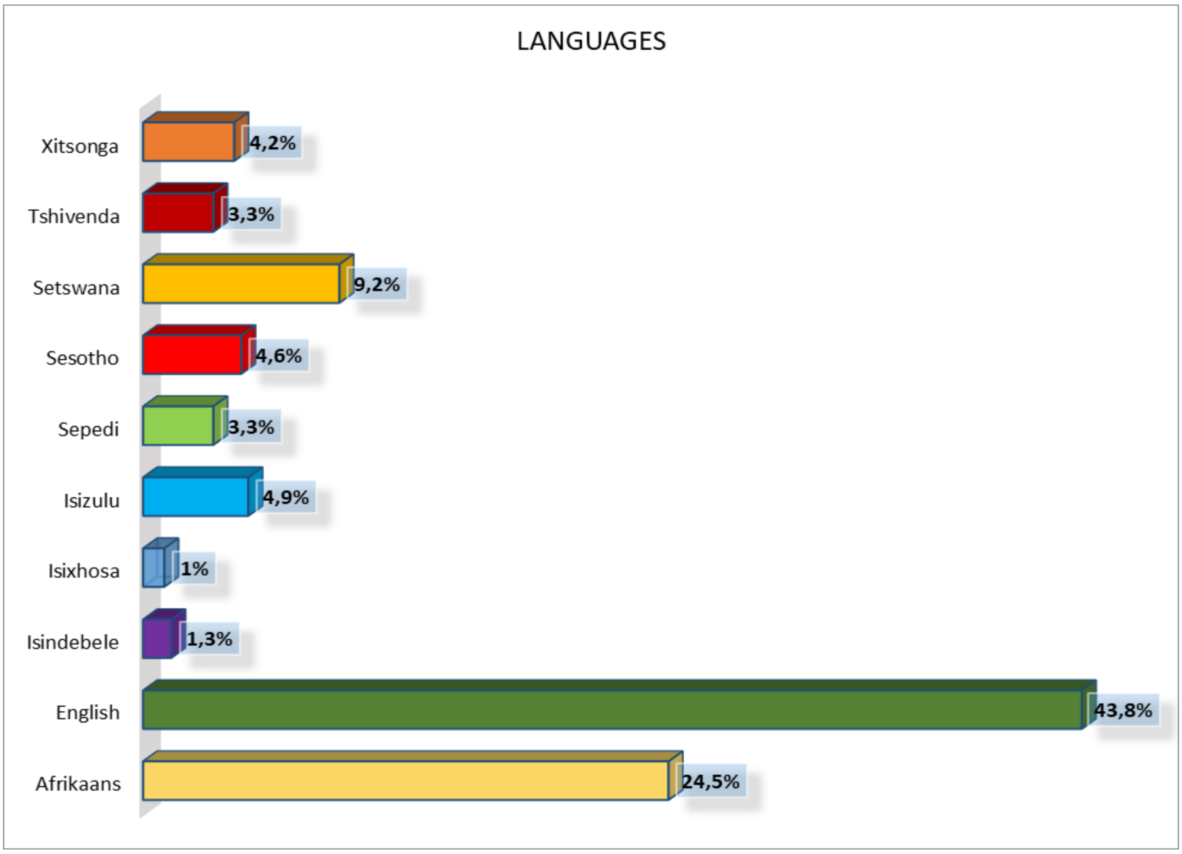

Figure 4.5: Languages of the respondents

Table 4.5 shows that most of the respondents were using English as their home language with a total of 134 respondents, accounting for 43.8%. 75 respondents used Afrikaans as their home language, which accounted for 24.5%, 27 spoke Setswana at home, which accounted for 9.2% and 15 respondents spoke isiZulu at home, which accounted for 4.9%. 14 respondents spoke Sesotho at home, which accounted for 4.6%, 13 respondents spoke Xitsonga at home, accounting for 4.2%, 10 respondents, spoke Tshivenda at home, which accounted for 3.3%, similar to Sepedi, which also accounted for 3.3%. Four respondents spoke isiNdebele at home, accounting for 1.3% and 3 respondents spoke isiXhosa at home, which accounted for 1 %. An observation of the above information shows that South Africa is truly a rainbow nation with multiple languages spoken in the work environment. English is still the highest percentage in this category because it is the most commonly spoken language and the medium of communication in the business world.

4.2.1.7 Number of employees in the company

The frequencies and percentages pertaining to the number of employees in the company are illustrated in table 4.7.

Table 4.6: Number of employees in the company

Number of employees in the company					
		Number of employees in the company	Percent	Valid Percent	Cumulative Percent
	< 21	38	12..4	12.4	12,4
	21 - 41	44	14.4	14.4	33.3
	42 - 62	57	18.6	18.6	52.0
	63 - 83	103	33.7	33.7	85.6
	84 - 104	44	14.4	14.4	100.0
	> 105	20	6.5	6.5	19.0
	Total	306	100.0	100.0	

Source: Developed by researcher

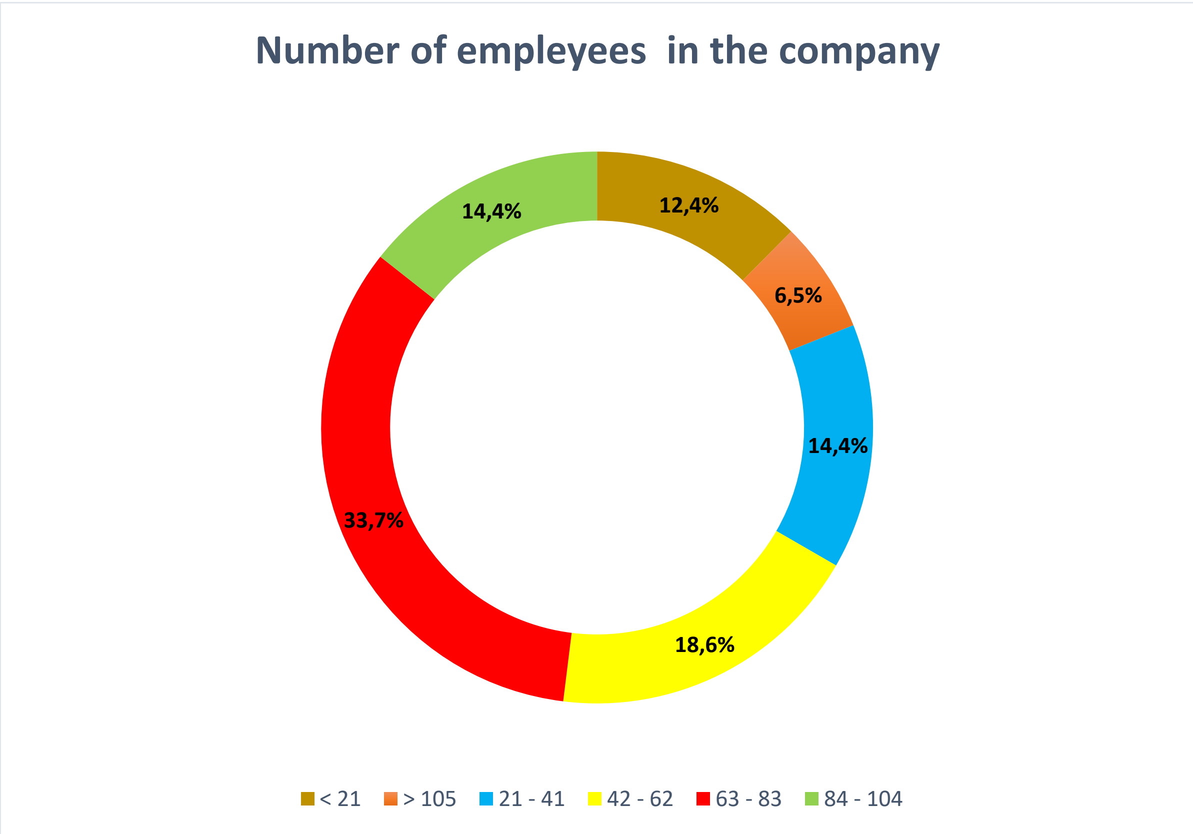

Figure 4.6: Number of employees in the company

Table 4.6 shows that most of the respondents (103) worked in a company with between 63-83 employees, which accounted for 33.7 %. 57 respondents worked in a company with between 42-62 employees, which accounted for 18.6 %, while 44 respondents worked in a company with between 21-41 employees, which accounted for 14.4 %. 44 respondents work in a company with 84-104 employees, which accounted for 14.4 %. 38 respondents worked in a company with 21 or less employees, which accounted for 12.4 % and 20 respondents worked in a company with more than 105 employees, which accounted for 6.5 %. One respondent did not specify the number of employees there were in their company. The reason why the 63-83 group was the highest percentage in this category could be that most companies are relatively larger organisations.

4.3 SCALE ITEM RESULTS

This study tested the relationship between five variables, namely production planning, production scheduling, delivery time, first to market and business performance. The study aimed to determine opinions of the respondents regarding each variable, to better demonstrate the levels of implementation of these factors in the manufacturing sector. It was important to get the respondents' feedback and opinions on the variables being measured as this could give a more accurate image of how manufacturing organisations operate and the strategies placed behind the operations. The results of the study are analysed in the sections that follow.

4.3.1 Frequencies and percentages of production planning

The frequencies and percentages pertaining to the production planning function based on the opinion of the respondents are illustrated in Table 4.7.

Table 4.7: Frequencies and percentages of production planning

ITEM	DESCRIPTION	Strongly disagree percent	Disagree percent	Moderately agree percent	Agree percent	Strongly agree percent	Standard deviation	Mean
PP1	Cost of production for each item is done prior to producing jobs	1 (0.3%)	1 (0.3%)	7 (2.3%)	73 (23.9 %)	225 (73.2%)	0.523	4.71
PP2	Number of machines, material and orders are known prior to planning	13 (4.2%)	2 (0.7%)	9 (2.9%)	72 (23.5%)	209 (68.3%)	0.931	4.52
PP3	Our factors of earliness or delays of a job are known by the planning department	1 (0.3%)	2 (0.7%)	14 (4.6%)	66 (21.6%)	223 (72.9%)	0.629	4.66
PP4	Production planning helps us reduce likeliness of job delays.	1 (0.3%)	1 (0.3%)	5 (1.6%)	63 (20.6%)	236 (77.1%)	0.464	4.76

According to Table 4.7, production planning is measured on cost realisation (PP1), capacity awareness (PP2), delivery bottlenecks understanding (PP3) and delivery delays realisation (PP4). The table above illustrates that 73 % of respondents strongly agreed with item 1, which states that the cost of production for each item is done prior to producing the jobs. This item illustrated the mean score of $\bar{x}$=4.71; SD=0,523 corroborates the level of agreement. Item 2 describes that 68 % of repondants strongly agreed that the numbers of machinery and equipment are known prior too planning. This is supported by a mean score of $\bar{x}$=4.52; SD=0,931. The third item is supported by 72 % of participants who strongly agreed with job delays being known by the planning department with $\bar{x}$=4.66; SD=0,629. Item 4 states that production planning helps reduce the likeliness of job delays, which 77 % of respondents strongly agreed with. This is supported by a mean value of $\bar{x}$=4.76; SD=0,464. Based on the results obtained, it is evident that manufacturing industries in South Africa understand the importance of having production planning in place. The reason why manufacturing industries are employing the function of production planning could be to reap benefits such as cost reduction and delivery lead time reduction. Dantzig (1951:340) and Sobeyko and Mönch (2017:392) affirm the importance of this construct by stating that production planning identifies activities, which need to be performed in order for the manufacturing plant to be efficiently executed in a cost- and waste-minimising manner.

The results obtained illustrate that most companies in the South African manufacturing sector perceive the production planning process as a vital manufacturing activity and implement the production planning best practices. Based on the results, it can be concluded that a misalignment of production planning practices could affect the overall business performance. An overall mean score of $\bar{x}$=4.662; SD=0.636 supports this view.

4.3.2 Frequencies and percentages of production scheduling

Respondents' perception of production scheduling as a function in manufacturing is illustrated in Table 4.8.

Table 4.8: Frequencies and percentages of production scheduling

ITEM	DESCRIPTION	Strongly disagree percent	Disagree percent	Moderately agree percent	Agree percent	Strongly agree percent	Standard deviation	Mean
PS1	Our company aims to continuously improve feasibility of production schedules	1 (0.3%)	1 (0.3%)	12 (3.9%)	104 (34%)	182 (61.4%)	0.568	4.58
PS2	Production scheduling is a critical part in the manufacturing department	1 (0.3%)	1 (0.3%)	23 (7.5%)	145 (47.4%)	136 (44.4%)	0.635	4.37
PS3	Production scheduling performs effectively throughout the manufacturing department	1 (0.3%)	1 (0.3%)	14 (4.6%)	80 (26.1%)	210 (68.6%)	0.603	4.63
PS4	Production scheduling actively assists us in meeting our delivery times.	1 (0.3%)	1 (0.3%)	11 (3.6%)	66 (21.6%)	227 (74.1%)	0.568	4.70

The research construct production scheduling proved to have a similar response rate to that of production planning. This construct was measured using four measurement items. The results indicate that the majority of the respondents agreed with the measurement items. The results range from between 47 to 74 % for this construct. 61 % of the respondents strongly agreed with their company's commitment to continuously improve the feasibility of the production. This is supported by a mean value of $\bar{x}$=4.58; SD=0,568. Item 2 was supported by 44 % of respondents who strongly agreed with production planning being a critical part in manufacturing. This obtained a mean value of $\bar{x}$=4.37; SD=0,635, which indicates a degree of agreement. Item 3 was supported by 68 % of respondents who strongly agreed with the effectiveness of production scheduling. This obtained a mean value of $\bar{x}$=4.63; SD=0,603. The respondents were first asked if their organisations continuously improved feasibility of production schedules, secondly, if production scheduling was performed effectively in the organisation and, lastly, if production planning assisted in meeting required delivery times, which most respondents strongly agreed with. The reasoning behind this could be that manufacturing industries are seeing the financial and operational benefits associated with production scheduling. A study by Ammar, Bettayeb and Dolgui (2020:1150) confirms that production scheduling can form an integral part of the manufacturing process if executed effectively. It can result in savings in cost and time for the business if performed optimally (Dametew *et al,* 2019:29).

The results confirms that the majority of the companies in the manufacturing industry have a strong focus and belief of the role played by the production scheduling function. This shows that there is alignment in the strategic role and effectiveness, which is carried by production scheduling. An overall mean score of $\bar{x}$=4.570; SD=0.593 supports this view.

4.3.3 Frequencies and percentages of delivery lead time

This study considers delivery lead time as a crucial function for manufacturing industries. Streamlining this function can provide benefits for the organisation. Table 4.10 shows the frequencies and percentages from participants of the study.

Table 4.9: Frequencies and percentages of delivery lead time

ITEM	DESCRIPTION	Strongly disagree percent	Disagree percent	Moderately agree percent	Agree percent	Strongly agree percent	Standard deviation	Mean
LT1	Our company's logistics department schedules deliveries using planned lead time target from manufacturing	1 (0.3%)	1 (0.3%)	15 (4.9%)	170 (55.6%)	119 (38.8%)	0.571	4.35
LT2	Our company uses a 3PL logistics company to reduce delivery lead times	4 (1.4%)	8 (2.6%)	121 (39.5%)	131 (42.8%)	42 (13.7%)	0.79	3.68
LT3	Our company aims to minimise time between order placement and order delivery	1 (0.3%)	1 (0.3%)	6 (2%)	85 (27.8%)	213 (69.6%)	0.529	4.67
LT4	Our company is able to respond quickly to customer orders	1 (0.3%)	2 (0.6%)	9 (2.9%)	68 (22.2%)	227 (74.1%)	0.539	4.71

Table 4.9 illustrates that 94 % of respondents either agree or strongly agree with item 1, which states that their company's logistics department schedules deliveries using planning lead time target form manufacturing. This is supported by a mean value of $\bar{x}$=4.35; SD=0,571, which validates the level of agreement. 74 % of respondents strongly agree with item 4, which states

that their company is able to respond quickly to customer orders. This has a mean value $\bar{x}$=4.71; SD=0,539, which confirms to the level of agreement. These results demonstrate that most manufacturing organisations drive lean manufacturing through minimising waste and improving manufacturing productivity. Respondents show significant belief and knowledge of delivery lead time and customer satisfaction. Delivery lead time directly influences the customer's perception on service delivery and if performed effectively, can result in higher rates of customer royalty (Cannella *et al*, 2017:130).

The above results illustrate that most companies are aligned with the strategic role that lead time plays in ensuring that business performance is maintained through continuous customer service. The use of a third party logistics company could still be explored to get the benefit of a faster customer order delivery time, fully. This view is supported by a mean score of $\bar{x}$=4.352; SD=0.607.

4.3.4 Frequencies and percentages of first to market

First to market was viewed by the respondents as a significant benefit to the manufacturing industry. The frequencies and percentages are depicted in Table 4.10.

Table 4.10: Frequencies and percentages of first to market

ITEM	DESCRIPTION	Strongly disagree percent	Disagree percent	Moderately agree percent	Agree percent	Strongly agree percent	Standard deviation	Mean
FTM1	Our company delivers product to market quickly	3 (1%)	18 (5.9%)	80 (26.1%)	162 (52.9%)	43 (14.1%)	0.805	3.75
FTM2	Our company's time to market is lower than the industry average	38 (12.4%)	103 (33.7%)	127 (41.5%)	19 (6.2%)	19 (6.2%)	0.994	2.60
FTM3	Our company's product development function influences the speed of new product to the market	4 (1.3%)	16 (5.2%)	84 (27.5%)	143 (46.7%)	59 (19.3%)	0.864	3.77
FTM4	Our company is always the first in the market to introduce new products	10 (3.3%)	39 (12.7%)	110 (35.9%)	115 (37.6%)	32 (10.5%)	0.949	3.39

The first to market construct shows interesting results in comparison to the previous variables. The first item, which states their company delivers products to market quickly, shows that 53 % of respondents agreed with this construct. This is validated by a mean value of $\bar{x}$=3.75;

SD=0,805. On the other hand, 47 % of respondents agreed with item 3, which states that their company's product development function influences the speed of new products to the market. This has a mean value of $\bar{x}$=3.77; SD=0.864. 74 % of the respondents agree or moderately agreed with item 4, which states that their company's product time to market is lower than the industry average, which is viewed as a positive response. The reason why respondents disagreed with item 3 could be that their company's time to market was higher than the industry average. The results from this research construct show that companies actively invest in research development to ensure that their products are the first in the market and this is confirmed in a study by Pradhan *et al* (2020:883). Businesses have to be able to adapt quickly to customer requirements and ensure that their product gets to the customer before their competitions. This can be achieved through innovation and continuous process improvements to remain competitive (Oni *et al*, 2019:69).

The results above prove most companies understand the notion of first to market to be viewed as a strategic component to obtain higher market share and a market leader position. The results show that the marketing and research department is relatively aligned with the production planning department. The overall average mean score is $\bar{x}$=3.377; SD=0.903.

4.3.5 Frequencies and percentages of business performance

The frequencies and percentages relating to the significance of business performance on the manufacturing industry are illustrated below in Table 4.11.

Table 4.11: Frequencies and percentages of business performance

ITEM	DESCRIPTION	Strongly disagree percent	Disagree percent	Moderately agree percent	Agree percent	Strongly agree percent	Standard deviation	Mean
BP1	Our company aims to improve quality of products produced	1 (0.3%)	1 (0.3%)	10 (2.6%)	132 (43.1%)	162 (52.9%)	0.56	4.55
BP2	Our company aims to maximise capacity utilisation in manufacturing	1 (0.3%)	1 (0.3%)	15 (4.9%)	117 (38.2%)	172 (56.2%)	0.587	4.57
BP3	Our company monitors resource utilisation rate	6 (1.9%)	2 (0.7%)	19 (6.2%)	104 (34%)	175 (57.2%)	0.697	4.52
BP4	Our company regularly introduces a numbers of production improvement systems and production flexibility	1 (0.3%)	8 (2.6%)	44 (14.4%)	114 (37.3%)	139 (45.4%)	0.775	4.33

The last construct, business performance, shows high rates of respondents either agreeing or strongly agreeing with all four measurement items. The first item states that their company aims to improve quality of products produced which 162 respondents representing 53% strongly agreed with. This construct has a mean value of $\bar{x}$=4.55; SD=0.56. Fifty-six % of respondents strongly agreed with item 2, which states that their company aims to maximise capacity utilisation in manufacturing. This obtained a mean value of $\bar{x}$=4.57; SD=0,587. The results of this research construct show that respondents' companies put high importance on business performance through quality improvements, capacity utilisation and system improvements. Fandel (1985:46) affirms the significant belief that the production theory and the theory of cost are continuously at the centre of business operations and contribute to the business' sustainability.

The results illustrated above show that most companies are dedicated to continuously improving their business performance. An overall mean score of $\bar{x}$=4.492; SD=0,654 proves that there is a focus on either maintaining or improving business performance through the means of product quality improvement, utilising maximum capacity and production improvements.

4.4 CONFIRMATORY FACTOR ANALYSIS

Confirmatory factor analysis is a special form of factor analysis, most commonly used in social research. It is used to test whether measures of a construct are consistent with a researcher's understanding of the nature of that construct or factor (Lewis, 2017:240). CFA is a multivariate statistical procedure that is used to test how well the measured variables represent the number of constructs. It is a statistical technique used to verify the factor structure of a set of observed variables (Blumberg *et al*, 2008:450). CFA allows the researcher to test the hypothesis that a relationship between observed variables and their underlying latent construct exists (Bell *et al*, 2011:112).

4.5 RELIABILITY

Reliability and validity of a measurement are the degree to which the measurement instrument employed has no error. The approach to assessing reliability includes using the Cronbach's alpha coefficient and alternative forms (Robinson, 2018:745).

Table 4.12: Accuracy analysis statistics

Research Constructs		Descriptive Statistics		Cronbach's Test		CR	AVE	Factor Loading
		Mean	SD	Item-total	α Value			
Production Planning	PP1	4.662	0.636	0.479	0.767	0.881	0.650	0.761
	PP2			0.702				0.919
	PP3			0.607				0.796
	PP4			0.520				0.738
Production Scheduling	PS1	4.570	0.593	0.459	0.704	0.803	0.513	0.519
	PS2			0.494				0.661
	PS3			0.446				0.770
	PS4			0.570				0.866
Delivery Time	DT1	4.352	0.607	0.361	0.711	0.856	0.672	0.581
	DT3			0.637				0.914
	DT4			0.614				0.918
First To Market	FM1	3.377	0.903	0.646	0.819	0.865	0.682	0.824
	FM2			0.780				0.905
	FM3			0.608				0.741
Business Performance	BM1	4.492	0.654	0.608	0.846	0.887	0.663	0.802
	BM2			0.757				0.873
	BM3			0.731				0.875
	BM4			0.677				0.824

Table 4.12 shows the Cronbach's alpha results, which confirm that all the constructs measured are reliable and fit for the study.

4.5.1 Cronbach's alpha test

The Cronbach's alpha test was applied in this study to measure the reliability of all constructs. The reliability of the constructs is determined by a higher level of the Cronbach's alpha coefficient. Dunn *et al* (1994:144) state that reliability of a construct must be above 0.7 in order to enhance the internal consistency of the construct. DT2 and FM4 were removed from the research constructs reliability analysis because the item to total correlation was less than three. It thus did not meet the threshold. The decision to move these constructs was made to obtain positive results for the data analysis. Based on Table 4.12, PP, PS, DT, FM and BP are over the threshold of 0.7, therefore, reliable. The item to total values observed from Table 4.12 range from 0.361 to 0.780, specifically between PP, PS, DL, FM and BP, which showed positive results and are above the required cut-off point of 0.3 as advised by Dunn *et al* (1994:145) and Nunnally and Bernstein (1994:1). Therefore, the Cronbach's alpha results affirm that all the constructs in Table 4.12 confirm the reliability of the measures used in the study for the research constructs.

4.5.1.2 Composite reliability

The composite reliability test was used to determine the internal reliability of each research construct. Fornell and Lacker (1981:64) used the following formula to examine composite reliability:

(CR): CRη= (Σλyi) 2 / [(Σλyi) 2 + (Σεi)]

Composite reliability = (square of the summation of the factor loadings) / {(square of the summation of the factor loadings) + (summation of error variances)}.

A composite reliability index value that is higher than 0.7 proves the adequacy of the internal consistency of the research construct (Alhadi *et al 2*018:285). An analysis of the data from Table 4.12 illustrates that all research constructs are above 0.7, which affirms that the existence of the internal validity of all constructs measured is reliable.

4.5.1.3 Average value extracted (AVE)

AVE is the total amount of variance considered by the latent research construct. The AVE estimate should be greater than 0.5 (Fornell *et al* 1981:66). Based on data from Table 4.12, AVE range between 0.51 and 0.67, which adheres to the required acceptability value; thus, only business performance met the required degree of acceptability (Bentler & Bonnet 1980:590).

Vη=Σλyi2/ (Σλyi2+Σεi)

AVE = {(summation of the squared of factor loadings) / {(summation of the squared of factor loadings) + (summation of error variances)}.

4.6 VALIDITY

Validity is concerned with the results of the research and relates to the credibility of the results (Soelton, Lestari & Arief, 2020:188). This study focused on testing for convergent and discriminant validities.

4.6.1 Convergent validity

Convergent validity is the extent to which two or more scales correlate to related measurement items. In this measure, items are expected to relate to other measures in the same construct (Alhadi *et al*, 2018:285). In this study, convergent validity was assessed by ensuring that item loadings indicated in Table 4.12 were above 0.5 and the AVE values were also above 0.5 (Fornell *et al*, 1981:40). The values for both item loadings and AVE were higher than 0.5, thereby indicating that convergent validity was acceptable in this study.

4.6.2 Discriminant validity

Discriminant validity refers to the extent to which scores from a measure are distinct and do not correlate to other measures. Discriminate validity was measured in this study through observing the correlation matrix as well as the AVE results (Dorrell, Moore, Smith, & Gee, 2018:4). The results of the correlation analysis are indicated in Table 4.13.

Table 4.13: Correlation matrix

Research Variable		BP	DT	FM	PP	PS
	BP	**1.000**				
	DT	.489**	**1.000**			
	FM	.412**	.555**	**1.000**		
	PP	.681**	.715**	.897**	**1.000**	
	PS	.429**	.522**	.604**	.675**	**1.000**

BP= Business Performance; DT = Delivery Lead Time; FM = First to Market; PP = Production Planning; PS = Production Scheduling

Table 4.13 depicts the correlation coefficients amongst the variables. It shows positive correlations across all constructs that are below the required level l of 1.0, which proves that there is an acceptable discriminant validity in the measurement scale (Bollen, 1990:260; Bentler & Bonnet, 1980:590).

4.7 SMART PLS MODEL

Smart PLS is a software tool used to assess the structural equation model. This software provides a variety of reports, reinforces statistical analysis and allows the researcher to conduct partial least square and path modelling results (Cheah *et al*, 2018:148).

Figure 4.8 depicts the path model for production planning on business performance.

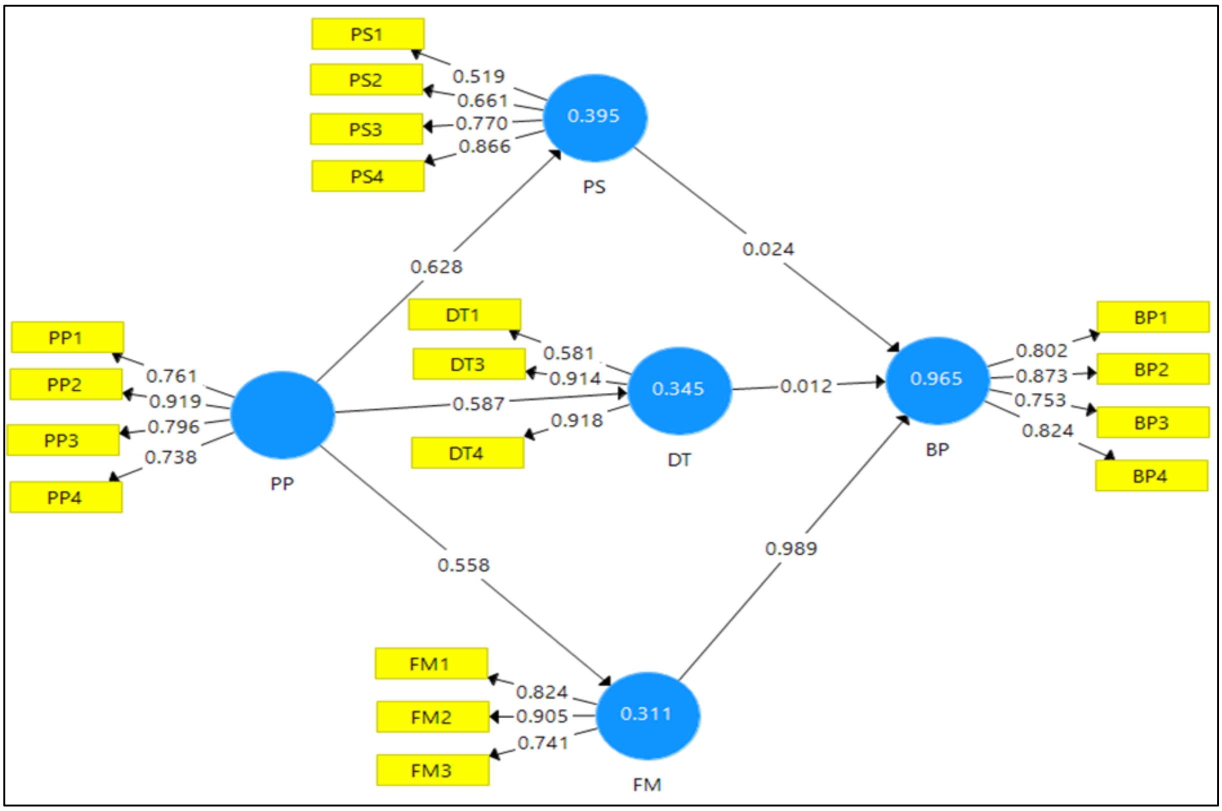

Figure 4.8: Structural model

Path model analysis facilitates the assessment of correlations between variables in accordance with their causal relationship and tests the structural path of the research model (Cheah *et al,* 2018:149).

Figure 4.8 shows the path model which tests production planning (PP) as the predictor variable, production scheduling (PS), delivery time (DT), first to market (FM) as the mediating variables and business performance (BP) as the outcome.

4.8 CONCEPTUAL MODEL FIT ASSESSMENT

Model fit assessment was performed using the Smart PLS 3 software. The acceptability of the model fit was established by the chi-square value over the degree of freedom ($\chi 2/df$). The value should be between 2 and not more than 5 (Tabachnick & Fidell, 2007:6). Values of goodness-of-fit index (GFI), comparative fit index (CFI), incremental fit index (IFI) and tucker-lewis index (TLI) should be superior or equal to 0.90 and the root mean square error of approximation (RMSEA) value should be equal to or below 0.08 (Johnson, Russo, & Schoonenboom, 2019:143).

As a result of the measurement instruments being adopted from several sources and still meeting the thresholds of all other measures such as reliability, validity and correlations, the data fit the model theoretically. The practical model fit was not absolute but close, due to the values being very close to their respective thresholds. Several academics have commented on some of the limitations of fit indices as prescribed below.

4.8.1 Limitations of fit indices

There are controversies and limitations about fit indices that have been presented by multiple researchers. Barrett and Rizza (2008:2) note that some researchers do not believe that fit indices add anything to the analysis and only the chi square should be interpreted. Kenny, Kaniskan and McCoach (2014:2) argue that fit indices should not even be computed for small degrees of freedom models. Hayduk, Cummings, Boadu, Pazderka-Robinson and Boulianne (2007:847) advocate for the value of fit indices but caution against strict reliance on cut-offs. They argue that cut-offs for a fit index can be misleading and subject to misuse. More so, Barrett *et al* (2008:7) highlight that models with more variables tend to have a relatively poor fit. They also state that the normed fit index fails to adjust for sample size, thus, models with larger sample sizes tend to have smaller values. Based on these insights, the model fit indices applied in this study were retained for information purposes only, even though they did not meet the suggested cut-off values by small margins.

4.9 PATH ANALYSIS RESULTS

Path analysis is a statistical analysis method used to evaluate models by examining the hypothesised dependencies or relationships between an independent variable and two or more dependant variables (Judea 2018:6).

4.9.1 Model fit assessment index

Table 4.14 outlines the goodness of fit criteria, the acceptable levels and the interpretation of nine fit indices that were employed in this study.

Table 4.14: Model fit indices and acceptable levels

Goodness of fit criteria measures	Recommended level	Level interpretations
Chi-square (x^2)	≤3	Values close to 1 reflect good model fit, values <3 reflect acceptable fit.
Goodness of fit index (GFI)	≥ 0.9	Values = or >0.9 reflect a good fit.
Norm-fit-index (NFI)	≥ 0.9	Values = or >0.9 reflect a good fit.
Relative fit index (RFI)	≥ 0.9	Values = or >0.9 reflect a good fit.
Incremental fit index (IFI)	≥ 0.9	Values = or >0.9 reflect a good fit.
Augmented goodness of fit index (AGFI)	≥ 0.9	Values = or >0.9 reflect a good fit.
Comparative fit index (CFI)	≥ 0.9	Values = or >0.9 reflect a good fit.
Tucker Lewis index (TLI)	≥ 0.9	Values = or >0.9 reflect a good fit.
Root mean square error of approximation (RMSEA)	≤0.08	Values <0.05 reflect a good fit; values between 0.05 and 0.08 reflect acceptable fit.

Source: Adapted from Reisinger and Mavondo (2007:57)

Table 4.14 illustrates the model fit indices and their acceptable levels basing on GFI, NFI, RFI, IFI, AGFI, CFI, TLI and RMSEA. The explanation acts as a guideline in the interpretation of the CFA and SEM in the subsequent sections. The acceptability and scale accuracy of the model fit assessment was inspected using the chi-square over the degree of freedom ($\chi 2/DF$). IFI, CFI, GFI, TLI and NFI should be equal to or greater 0.90 in order for the value to be acceptable (Bentler & Bonnet, 1980:590 ; Bollen 1989:82). Lastly, RMSEA should be lower than or equal to 0.08 (Bollen, 1990:260). The model fit assessment results are as follows

Table 4.15: CFA model fit indices results

Fit index	Results
Chi-square ($x^{2)}$	3.124
GFI	0.901
NFI	0.904
RFI	0.903
IFI	0.943
TLI	0.922
CFI	0.900
AGFI	0.902
RMSEA	0.081

Table 4.15 shows that chi-square/degree of freedom is 3.124. Its value is more than the recommended threshold of ≤3 which therefore indicates acceptable model fit, as asserted by Bollen (1990:260). Furthermore, Table 4.15 depicts that the values of GFI being 0.901, NFI 0.904, RFI 0.903, IFI 0.943, TLI 0.922 and CFI 0.900 meet the recommended threshold of 0.9, which means the data fit the model. However, Table 4.16 indicates an AGFI value of 0.902 that is equal to the recommended threshold of ≥0.9, as presented (Bentler & Bonnet, 1980:590; Bollen 1989:82). Therefore, the RMSEA value in Table 4.15 is equal to 0.081, which confirms that the data fit the acceptability of the model (Bollen, 1990:260).

4.9.2 Structural equation modelling (SEM)

In this study, SEM was conducted to evaluate the relationships between the research constructs. This procedure covers multiple regression analysis and path model analysis. Similar to the CFA assessment results, IFI, CFI, GFI, TLI and NFI should be equal to or greater than 0.90 in order for the value to be acceptable (Bentler & Bonnet, 1980:590; Bollen ,1989:82). Lastly, RMSEA should be lower than or equal to 0.08 (Bollen, 1990:260). The model fit assessment results are as follows:

4.9.2.1 Model fit assessment

Table 4.16 presents the results of the model fit assessment.

Table 4.16: SEM model fit indices results

Fit index	Results
Chi-square ($x^{2)}$	2.900
GFI	0.890
NFI	0.900
RFI	0.931
IFI	0.944
TLI	0.909
CFI	0.858
AGFI	0.870
RMSEA	0.079

Table 4.16 shows that chi-square/degree of freedom is 2.900; the value is below the recommended threshold of ≤3, which signifies acceptable model fit, as asserted by Chinomona (2011:118). Furthermore, Table 4.16 depicts the values of NFI at 0.900, RFI at 0.931, IFI at 0.944 and TLI at 0.909 meet the recommended threshold of 0.9, which confirms that the data are a good fit for the model. However, Table 4.16 indicates GFI being 0.890, CFI at a value of 0.858 and a AGFI value of 0.870 but meet the recommended threshold of ≥0.9 (Bentler & Bonnet, 1980:590), which means the data are fit for the model. Lastly, the RMSEA value in Table 4.16 is less than 0.08 at 0.079, which confirms that the data fit the acceptability of the model (Bollen, 1990:260).

4.9.3 Hypotheses testing results

Once the reliability and validity of the research constructs and measurement instruments were proved and confirmed, the Smart PLS software was used to test and verify the relation of the hypothesis. Letshaba and Chinomona (2019:13) and Mugwenhi *et al* (2019:80) used the Smart PLS software for a descriptive analysis.

Table 4.17: Results of hypothesis testing

Path Coefficients	Hypothesis	Path Coefficient	P value	T-Statistics	Decision
Production Planning -> Production Scheduling	H1	0.628	***	8.006	Significant and supported
Production Planning -> Delivery Time	H2	0.587	***	13.649	Significant and supported
Production Planning -> First To Market	H3	0.558	***	7.121	Significant and supported
Production Scheduling -> Business Performance	H4	0.024	***	4.255	Significant but not supported
Lead Time -> Business Performance	H5	0.012	***	3.333	Significant but not supported
First to Market -> Business Performance	H6	0.989	***	19.910	Significant and supported
Significant Level <0.05 *; significant level <0.01 *** ; significant level <0.001 ** BP= Business Performance; DT = Delivery Lead Time; FM = First to Market; PP = Production Planning; PS = Production Scheduling					

Table 4.17 focuses on the P value, which refers to the number of stars between variables. Having three stars shows a strong relationship and significance of 99 % and the P value is at 0.001, two stars is at 95 % and the P value is less than 0,005, one star is at 90 % and the P value is less than 0.001, while no stars at all means that there is no significance between the data and variables (Bollen 1989:82). The relationship between production planning and production scheduling is significant with β=0.628, p value < 0.001. This proves that having both production planning and production scheduling as functions in a manufacturing company are essential. The relationship between production planning and delivery time has a β=0.587, p value < 0.001, meaning that the relationship is very strong and significant. The relationship

between production planning and first to market is strong, significant and powerful at β=0.558, p value < 0.001. This shows that production planning directly impacts the first mover advantage of the company. The relationship between production scheduling and business performance has a coefficient value of 0.024 means there is no influence between these variables. The relationship between delivery time and business performance obtained the coefficient value of 0.012, which means there is no influence between these variables. Lastly, first to market and business performance prove to have a very strong and significant relationship with three stars. This shows that organisations must put more effort into first to market as this function affects the organisation positively.

4.10 RESULTS DISCUSSION

The below section provides the empirical objectives of the study.

4.10.1 Results for hypothesis 1

Hypothesis 1 stated that there is a positive relationship between production planning and production scheduling. The path coefficient value for this hypothesis is β = 0.628, which confirms the positive relationship between the two variables. The results acquired from testing hypothesis 1 confirm the influence between production planning and production scheduling with the p value being at a significant level of $p<0.001$ and the t-statistic at a value of 8.006. The hypothesis proves a significant relationship between the two variables and supports the alignment between the two at 99 %. The results obtained from this study are supported by Wu *et al* (2017:150), Yang *et al* (2017:680) and Kaltenbrunner *et al* (2020 :121) who regard production planning as a strategic function in the manufacturing process and closely related to production scheduling. The authors also elaborate on the coexistence of the two variables.

Based on the results obtained, it can be concluded that when organisations align planning and scheduling strategically, it becomes highly likely that they can effectively execute lean manufacturing. Dametew *et al* (2019:25) affirm that production scheduling cannot be successfully executed without the function of production planning.

4.10.2 Results for hypothesis 2

Hypothesis two stated that there is a positive relationship between production planning and lead time. This is confirmed through the path coefficient β = 0.587; $p<0.001$ and t-statistic at

13.649. The results obtained from testing H2 prove a positive relationship between production planning and delivery lead time. This means that without the use of planning, delivery lead times would not be met. The test found that H2 is acceptable and supported at 90 %. These results, therefore, prove the relationship between the variables as hypothesised.

Therefore, it can be confirmed that required delivery lead time is directly impacted by the production planning function. The planning department plans jobs based on the required delivery time through various production strategies (Plenert, 1993:258; Fera *et al*, 2020:412) Some manufacturing companies use event-based production planning, which works to reduce manufacturing costs by adhering and scheduling production jobs on the basis of the delivery date (Pielmeier *et al*, 2019:374).

4.10.3 Results for hypothesis 3

Hypothesis three examined the relationship between production planning and first to market. The study revealed that there is a positive relationship between the two variables. The path coefficient $\beta = 0.558$; $p<0.001$ and t-statistic at 7.121 confirm the significantly positive relationship between these variables. H3 states a positive result between first to marketing and production planning. Table 4.17 reveals that H3 was found accepted at 90 %. These results confirm the relationship as hypothesised. Feng, Jiang, Li and Feng (2018:26) affirm these results by stating that the function of production planning is crucial for an organisation aiming to attain the first mover advantage. The aid of marketing research planning can ensure that products reach consumers before a competitor is able to produce a similar product (MacCarthy & Brabazon, 2020:5).

Thus, in order for a manufacturing firm to succeed being the first to the market, products should be produced at the right time, in the right quantity and right quality (Pielmeier *et al*, 2019:5). These two variables directly influence the customers' perception and increase brand loyalty.

4.10.4 Results for hypothesis 4

Production scheduling has been found to be significantly influenced at 90%. The fourth hypothesis tested whether there is a positive relationship between production scheduling and business performance. The results of this study reject this claim. The $p<0.001$ and path coefficient is $\beta = 0.024$. Furthermore, the t-statistic value is observed at 4.255. This illustrates that production scheduling in the manufacturing organisation will not influence business performance. The literature has supported the significance of the scheduling function on business performance. This is supported by Yang *et al* (2016:322) and Pham (2020:722), who state that production scheduling is a vital function in manufacturing as this heightens control in the factory, ensures continuous flow and prevents bottlenecks, thus improves overall business performance.

In this view, although there is no relationship between the variables, the results were significant, meaning they can be considered as confident.

4.10.5 Results for hypothesis 5

As depicted in table 4.17, the relationship between delivery lead time and business performance was rejected. This hypothesis is significant but there is no relationship between the variables, with the path coefficient at $\beta = 0.012$; $p<0.001$ and t-statistic at 3.333. It can be concluded that there is very little influence between delivery-time and business performance. This finding is however contradicted by Tripathi *et al* (2019:7) who found that the inability for an organisation to meet customers' required delivery lead time creates supply uncertainty and unreliability. This directly reflects poor performance of the business (Madankumar *et al,* 2018:5). The results of the study are not aligned with the results of previous researchers. This could mean that these results could be part of the few that found no influence between delivery time and business performance.

In this view, although there is little influence between the variables, the results are significant, meaning they can be considered as confident.

4.10.6 Results for hypothesis 6

Lastly, hypothesis 6 expressed the positive relationship that exists between first to market and business performance and this is supported and accepted by the study. The two 'constructs' path coefficient value was $\beta = 0.989$; $p<0.001$ and the t-statistics a phenomenal 19.910. The results obtained following the test of H6 affirm the influence between first to market and business performance significantly. The relationship between the two variables is accepted at 90 %. Tseng and Tseng (2019:110) confirm the association between the two variables aligned for firms due to its ability to attain a competitive advantage through brand awareness for the organisation. Hietala (2017:2) and Gossé *et al* (2020:12), on the other hand, found that focusing on brand knowledge, market requirements and customer knowledge ensures that the organisation is the first to penetrate the market, resulting in optimum business performance.

It can be concluded that first to market is critical in the success and overall performance of the business. This function plays an important role in gaining business market share and potentially being the market leader. This function requires more focus from manufacturing companies in order to reap the full rewards.

4.11 CONCLUSION

The purpose with this chapter was to analyse and assess the data collected. A large part of Chapter 4 stemmed from data collection through the use of questionnaires. The researcher had to interview a variety of respondents through the distribution of questionnaires and conduct a data analysis using Smart PLS Software 3 to run the data. The first section examined the demographic background of the respondents, including gender, race and age group. The second part detailed the results of the tested variables. These results proved that there were strong relationships between the variables identified and that the variables influenced the business performance. The study saw a significant relationship between production planning and production scheduling and supported the alignment between the two variables at 99 %. The study also confirmed the relationship between production planning and the first-to-market function, which is accepted at 90 %. The study shows the relationship between production planning and delivery lead-time is acceptable and supported at 90 %. The relationship between production scheduling and business performance proved to be significant at 90% as well, while delivery lead-time and business performance proved to have very little influence and therefore was rejected. Lastly the relationship between first to market and business performance is supported and accepted by the study. There were some factors that did not meet the required rates and could thus not be used in this study. Throughout this chapter, the results of the research were analysed and interpreted and comment was made on why the results turned out the way they did.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The purpose with this chapter is to present the results, implications and conclusions of facts and points realised in this study. The chapter details the conclusions of the investigation conducted throughout the study as well as the suggested strategies, which can be implemented in manufacturing industries. The chapter commences by providing an overview of the entire study, followed by the conclusions to theoretical and empirical objectives versus the results of the study. Thereafter, the chapter provides the suggested recommendations and contributions for each of the variables measured in the study. Finally, the limitations experienced throughout the study as well as suggestions that future researchers can undertake are elaborated on. This final chapter is of vital importance to tie the entire study together and provides a continuation base for future researchers.

5.2 OVERVIEW OF THE STUDY

The purpose of this study was to determine the impact that production planning has on business performance in manufacturing industries when used as a risk management technique. The first chapter introduced and elucidated on the background of the research topic, defined the problem statement, outlined the theoretical and empirical objectives and discussed the research methods and the ethical considerations. In this chapter, the conceptual model and hypotheses are presented and discussed. The framework adopted for this study consists of production planning as the predictor variable, production scheduling, lead time and first to market as the three mediating variables and business performance as the output variable.

Chapter 2 began with providing the context and the literature of the manufacturing industry globally versus the South African industry. This chapter outlined the challenges faced by the manufacturing industry as a whole, as well as best practices shared in the manufacturing industry. The manufacturing industry contributes to the economy of the country. The statistics confirming the contribution of manufacturing in the last few years were shared in the body of Chapter 2. The second part of the chapter detailed the origin of the production theory and discussed how this theory affects current production practices as well as the benefits of this theory. The origin, dimensions and antecedent of each variable were also discussed in this chapter.

Chapter 3 outlined the research methodology and the research design adopted in the study. This study employed a quantitative research method and the target population was restricted to manufacturing industries in Gauteng. The sample frame used was kept to 350 respondents. The study adopted the probability sampling approach using the random sampling method because this technique is known to provide more accurate results. Primary data were collected through a survey using a structured questionnaire and data were analysed through the Smart PLS Software.

Chapter 4 discussed the data analysis and provided an interpretation of the results of the study. Based on the results of the study, this chapter also discussed the relationship and significance of the hypotheses. In this chapter, the correlation of the variables was assessed and discussed to validate the study.

Chapter 5 covers the conclusions of the results of the study in comparison to the theoretical objectives. This chapter also provides the contributions, limitations and recommendations for future researchers.

5.3 CONCLUSIONS BASED ON THEORETICAL OBJECTIVES

This section explores conclusions based on the following theoretical objectives identified in Chapter 1:

- To review the literature on production planning as a risk management technique
- To review the literature on production scheduling influencing business performance
- To review the literature on delivery lead time influencing business performance
- To review the literature on first to market strategy affecting business performance.

5.3.1 Conclusion pertaining to the literature on production planning as a risk management technique

The vital role played by production planning in any manufacturing industry has been confirmed to directly influence business performance. Chapter 2 of this study detailed the origin of the production theory and its necessity, strategic function as well as beneficial advantage in manufacturing (Dametew *et al,* 2019:27). Chapter 2 further demonstrated that across the world, the manufacturing industries directly impact the GDP and employment and human capital development (Department of Trade and Industry 2017:3). The production theory tests the economic process of transforming inputs into outputs, thus standardises the production plan adopted by manufacturing companies. The process of production planning has been a result of the rising need for optimum production performance by manufacturing organisations (Shatz *et al*, 1996:338). Production planning has proven to positively reduce the risk of a manufacturing company's ability to fulfil consumer needs through ensuring that the required products meet the demand. The study identified that potential risk, which could be incurred, is production at a higher manufacturing cost; production planning reduces this risk through ensuring jobs are run at an effective speed on efficient machinery.

This is achievable through planning longer production runs to reduce the number of production changeovers, which also requires less labour. Another risk is high-energy consumption and minimum waste manufacturing practices. The function of production planning serves as a lean manufacturing practice executer (Ammar *et al*, 2020:1151). Production planning ensures that production jobs maximise production capacity and minimise overall production waste. Production planning serves as a risk-controlling function in the manufacturing industry.

5.3.2 Conclusion pertaining to the literature on production scheduling influencing business performance

This study aimed to measure and test whether production planning is performed in manufacturing industries as a risk management technique. Throughout the investigation, the antecedents identified as being suitable to carry out this study were production scheduling, lead time and first to market. First, the notion of production planning refers to the process of conversion of different material goods into finished goods. This consists of various types of productive performance that can be executed in raw material productions, processing plants as well as finishing plants (Fandel, 1985:67).

This variable identifies machinery and equipment investments as an antecedent to production planning. Raw material availability with production scheduling is a dimension to this variable.

The function of production scheduling has proven that there is no influence on the overall business performance, although there are high cost efficiencies, which can be achieved through this function. Jayaslaw and Jewkes (2016:2799) debated the importance of production scheduling as a separate function from production planning. The results of this study show that production scheduling has little influence on business performance.

5.3.3 Conclusion pertaining to the literature on delivery lead time influencing business performance

Delivery lead time on business performance has been widely researched by various authors confirming the significant relationship between the two variables. However, the results of this study show that there is no relationship between these two variables. Although lead time directly influences the customer's satisfaction, trust and reliability in the business as a long-term strategic partner, the study has proven that lead time does not directly influence business performance (Yuan *et al*, 2016:6106). The antecedents of lead time delivery are customer satisfaction, service quality as well as customer relationship quality.

Therefore, this study concludes that lead-time reduction is a customer facing strategic function, which indirectly impacts the customer's perception of business performance.

5.3.4 Conclusion pertaining to the literature on first to market strategy affecting business performance

The literature on first to market shows the necessity of capital investments from organisations in research and development for the growth of the organisation. Through this study, it has now been proven that most manufacturing companies in Gauteng do not focus on this strategy, thus lose the opportunity to gain the benefits of being the first to market.

Although this variable is often neglected, it is a significant background strategy to improve business performance through creating customer brand awareness. Antecedents identified for first to market include customer knowledge, knowledge management as well as service quality. This function can ensure that the company gains a larger market share, market leader advantage or cost leader advantage. The overall business performance in a manufacturing industry can be improved through driving lean operations to leverage on minimised manufacturing costs and waste.

5.4 CONCLUSIONS BASED ON EMPIRICAL OBJECTIVES

The conclusions below are derived from the results tested from the empirical objectives.

5.4.1 Conclusion on the relationship between production planning and production scheduling

This study concludes that production planning has a positive contribution to the successful execution of the production scheduling function in the manufacturing industry. This conclusion is supported by the study conducted by Dametew *et al* (2019:25), who mention that effective production scheduling cannot be achieved without the support of a production plan. In this view, it could further be confirmed that production planning and production scheduling must be set up as two different activities that remain aligned. The results of this study prove that production planning and production scheduling both have a significant impact on the productivity and profitability of manufacturing. This is supported by studies conducted by Kumar *et al* (2019:3), who identify production planning as a vital requirement for waste and cost minimisation, which can be achieved through effective production scheduling.

5.4.2 Conclusion on the relationship between production planning on lead time delivery

This study has found that there is a positive and strong relationship between production planning and lead time delivery. The notion of production planning relates directly to lead time because it manages the flow of production from the order being placed to the required delivery time. Pielmeier *et al* (2019:374) confirm this by mentioning that without a production plan in place, products will not reach their destination at the right time, of the right quality and right quantity. This study has found that using lead time as a base for production planning results in reduced delivery lead time to customers. These views are supported in the studies of Plenert (1993:258) and Ammar *et al* (2020:1151), who prove that aspects such as delivery lead time should be implemented as a production strategy.

5.4.3 Conclusion on the relationship between production planning and first to market

In view of the results obtained from this study, it can be concluded that production planning influences the first to market function positively. This study has proven that production planning can play a vital role in ensuring that the products reach the market, shelves and consumers before any competitors' products. The importance of production planning to first to market is confirmed by Feng *et al* (2018:26), who refer to production planning as a crucial function to ensure that companies achieve first mover advantage. Furthermore, this view is supported by a study conducted by MacCarthy *et al* (2020:2) as well as Nam *et al* (2019:6), who confirm the role played by production planning in ensuring that products reach customers earlier than those from competitors. This study has found that the relationship between the two variables is important and must be looked into by more supply chain, marketing and operations practitioners in the manufacturing industry.

5.4.4 Conclusion on the relationship between production scheduling and business performance

The results obtained from this study have proven that production scheduling has little impact on business performance. The study can further conclude that effective production scheduling can have an indirect influence on businesses performance from cost reduction, waste reduction and higher productivity perspectives. The literature pertaining to production scheduling effecting businesses bottom-line is confirmed by academics such as Wu *et al* (2017:151), who state that production scheduling carried out effectively can save the organisation's resources. Based on the results of this study, the manufacturing industry in Gauteng recognises the impact that production scheduling has on business performance and treats it as a strategic function (Nguyen *et al*, 2020:73). Pielmeier *et al* (2019:375) agree with the results of this study by mentioning that planned production scheduling can effectively result in improved efficiencies in the manufacturing plant.

5.4.5 Conclusion on the relationship between delivery lead time and business performance

Contradicting literature exists on the significance of the influence between lead time and business performance. The literature by Tripathi *et al* (2019:7) confirms that although delivery lead time can result in increased customer satisfaction and customer loyalty, it has very little impact on business performance. Considering the results of this study, it can be confirmed that there is very little statistically significant difference between lead time and business performance. The results of this study have proven that although the two variables are interrelated, the delivery lead time of products can increase customers' perception of the brand but not the bottom-line performance of a business (Lagos *et al*, 2020: 40).

5.4.6 Conclusion on the relationship between first to market and business performance

In light of the results that emerged from this study, it can be concluded that first to market has a strong relationship with business performance. Results have indicated that first to market is one of the most important strategic functions, which affect business performance. The literature from Tseng *et al* (2019:110) confirms that the first mover advantage is an essential factor to improve brand perception and increase brand visibility. This view has been obtained from the results, which demonstrate a strong influence between the company attaining the first mover advantage and businesses performance.

5.5 RECOMMENDATIONS

The results in this study highlight positive influences in the manufacturing industry. Arising from these results, certain recommendations, which can lead to beneficial manufacturing practices, can be made.

5.5.1 Production planning to production schedule

It has been confirmed that production planning and production scheduling indeed have a strong and significant relationship. It could still be argued that the functions of production planning and production scheduling are similar, but Dametew *et al* (2019:23) confirm these to be different and equally important. Based on the results of these two variables, it is important for people occupying managerial positions in the manufacturing industry to recognise the role of the variables in order to benefit from their collaboration. Efficiencies can be leveraged from aligning these two variables for better operational output and minimised time and resource wastage. Manufacturing companies may consider the following strategies to benefit from this relationship:

- Investing in a material requisition plan system that can assist in creating transparency of jobs or products required to be manufactured, material required and availability, equipment and capacity required and its availability and required delivery date. Having all this information in one platform ensures that jobs are planned in the most efficient manner.
- In order for the production plan to be executed effectively, production scheduling must be completed in a manner that ensures that all production bottlenecks are identified prior to jobs being planned for production. Having information such as workflow, production run time and production inputs ensure that the production plan is executed effectively.

- Schedule production maintenance regularly to minimise production breakdowns.

5.5.2 Production planning and lead time

It has been revealed that without a production plan, delivery lead time may not be attained. Wang *et al* (2017:3) affirm this by considering delivery lead time as an important aspect in the production plan flow. The relationship between production planning and delivery lead time has proved to be significantly strong. Planning production ensures consumers' required delivery date is met; this is a component that increases supplier reliability to the consumer (MacCarthy *et al, 2*020:7). A positive factor of production planning is the realisation of a reduction in the delivery lead times. Organisations can consider implementing the following recommendations:

- Planning production jobs timeously with a clear view of required delivery dates to ensure that timelines are met.
- The JIT system may not be the most efficient system that can be used but for the purpose of meeting or even reducing delivery lead time, this is a system that manufacturing companies can implement.
- The just in case system pertains to manufacturing ahead of a customer order as a method to build up stock. This can be executed successfully with the assistance of a forecasting and demand-planning team. This system is useful for companies with regular repeat orders from their customers.
- Establish partnerships with third party logistics services to focus solely on transporting products to customers.

5.5.3 Production planning and first to market

The results convey that production planning has a positive and strong impact on first to market, thus, these two variables have a significant relationship. Using production planning strategically can result in the manufacturing company getting their product on the shelves before their competitors (Pradhan *et al,* 2020:884). Using production planning strategically can result in the company attaining the first to market advantage, growing and securing their market share. Furthermore, recommendations proposed are as follows:

- A cross-functional team between operations, production planning, marketing and R&D must be formed as a strategic team that corroboratively ensures that the company attains the market leader advantage and increase their market share. This can be accomplished through ensuring that new product developments reach the shelves prior to the competitors (Poelmans *et al*, 2019:4).

- Investing capital in marketing and R&D to provide these departments with resources that assist in acquiring information relating to consumers' needs can aid in the process of gaining early market entrance and setting the standard for the products being launched. This could also result in strong brand recognition and gain customer loyalty.

5.5.4 Production scheduling and business performance

The results of this hypothesis prove that production scheduling has no influence on business performance. Production scheduling can be used as a lean manufacturing tool to ensure that production jobs are produced in the most efficient way (Kumar *et al*, 2019:5). If production scheduling is planned and executed strategically, it could minimise operational costs and reduce wastage cost, which can contribute to business performance. The below recommendations can assist in attaining benefits related to this relationship:

- Implement a master production scheduling system that can increase visibility of stock and jobs to be manufactured for effective planning. This will assist in reducing costs associated with wastage in the plant.
- The use of a scheduling system can assist in reducing process change over time and labour costs and provide real time information on jobs and accuracy in delivery times.

5.5.5 Lead time and business performance

The results of this study confirm that delivery lead time, as a key contributor in business performance, must still be explored. In most cases, the manufacturing industry is fast-paced and requires product delivery turnover to be relatively fast, thus, the consumer's perception of a supplier's reliability is based on aspects such as delivery lead time, amongst others. Service delivery is a key component to business performance, therefore, lead time reduction should be a continuous improvement in any manufacturing company (Mwalim *et al*, 2019:3). The following recommendations and strategies are proposed:

- Use the customers' required delivery date as a method for planning jobs.
- Ensure that there is accurate information being shared during the production planning process. It is important to realise what delays could possibly arise that will push out the 'customers' required delivery date. This could include material availability, labour

availability and machinery capacity. Once all the possible bottlenecks are identified, production lead time should be attainable.

- Forecast and produce stock requirements based on historical data for faster turnover times. However, this should be carefully applied as it could potentially lead to high inventory levels.

5.5.6 First to market and business performance

The results of this study acknowledge that first to market has the strongest impact on business performance. This could be used as a strategic tool to grow the company's consumer base and be a market leader. Pradhan *et al* (2020:884) state that it is crucial for manufacturing companies to establish strategies to attain the first to market advantage and sustain the market leader position. Therefore, it is important that the research and development function is provided with resources to gain this advantage for the organisation. The following strategies and recommendations can be implemented:

- Investment in marketing and research and development is essential for creating new and exciting offerings for customers and getting products to shelves before other brands.
- Building a strong brand could be attained through high quality, low pricing or most functional products. Building a strong brand can gain the organisation customer loyalty and gain a competitive edge.
- Set the standard for the products being launched and offer high quality products at the most reasonable price in order to attain both cost leadership and brand preference.
- Promote products on various platforms in order for consumers to start recognising you as the brand leader.

5.6 THEORETICAL CONTRIBUTIONS OF THE STUDY

The literature presented in this study proved to be relevant to the current systems used in the manufacturing industry. The study contributes to the 'readers' understanding of employing production planning as a risk management technique to assist and improve business performance. The study provides significant theoretical contributions, which can be easily implemented into any manufacturing company with sufficient capex attached.

The literature depicts from previous research that production planning positively contribute to the obstacle-free production productivity (Nguyen *et al* 2020:69). This study also highlights the financial benefits, which surface as a result of having production systems in place. This study is supported by Cobb *et al.* (1928:139), who mention reduction in manufacturing costs through the production theory. The literature reviewed in this study reveals the positive relationships that exist between each variable and overall business performance. This study identified production planning, production scheduling, lead time, first to market and business performance as the core variables and positive risk prevention variables which should be focused on by the organisations. These variables proved to be vital in mitigating risks associated with manufacturing cost, customer retention and operation efficiency. The study explains the difference between planning and scheduling, which were previously identified as a single function and the importance of treating them separately, but in alignment.

This study developed a research model that details factors, which are considered vital contributors to mitigating risks in manufacturing. The research model can be modified to include more variables that can also influence business performance, such as just in time, inventory control and other cost-saving initiatives.

5.7 MANAGERIAL CONTRIBUTIONS OF THE STUDY

The study found strategic benefits that can be leveraged by managers in the manufacturing industry. One of the major contributions of this study is the significant impact that the first to market function has on the business performance. The results of the study prove that if organisations invest in sufficient research and development to improve the execution of the first to market strategy, a higher market share for the organisation can be yielded. This strategy can also retain and gain customer loyalty, brand preference and a competitive advantage through being a market leader. Similar to this, the study also proves that lead time is crucial to business performance. This function secures customer trust and supplier reliability (Dametew *et al,* 2019:27). Although the results indicate that an investment in third party logistics services may be required, this can significantly improve the supply chain performance of the business. Finally, the results obtained by the study highlight the gap in business performance management, an overall focus on capital expenditures investment throughout the company from skills development and training, marketing and research and development.

5.8 LIMITATIONS OF THE STUDY

This study provided important and practical insights pertaining to the antecedent factors to business performance. However, during the course of conducting the study, there were a few constraints, which resulted in hurdles to complete the study, which future researchers should take into consideration. One constraint was the manner in which the questionnaires were distributed to participants. The study used an electronic and physical method to send and collect questionnaires. The electronically sent questionnaires had very few respondents and errors in completion. All questionnaires were filtered and those not useful were discarded. Another constraint was time – the researcher is a full-time employee and found it very difficult to balance work and school, mainly when it came to data collection. Better planning of time from the start would have assisted highly in this regard. The third constraint, namely the sample size, was only limited to Gauteng. The study could have received more participants if the sample was taken across multiple provinces. Lastly, some of the respondents seemed to give random answers instead of reading through and giving accurate answers and this could have resulted in results of the study being false.

5.9 IMPLICATIONS FOR FUTURE RESEARCHERS

The results of this study could prove to be very insightful for organisations in the manufacturing industry, specifically general managers and production/operations practitioners. Future research on this topic will still have potential to bring new information to light. Future researchers can consider broadening their sample size by including other provinces. This particular study used a quantitative method for data collection. Future researchers can consider using both a qualitative and quantitative approach. This can give the researcher an opportunity to get further constructive details from the respondents. This study drew six hypotheses statements, although there was potential for more. Future studies can expand the field of research by looking into other contributing variables. Future researchers can look into the benefit of transparent and better relationships with raw material suppliers. This directly influences the resource availability for production. The benefit of reduction of production waste could be investigated as well as forecasting demand versus capacity utilisation. These variables could have a significant influence on production planning and business performance.

5.10 CONCLUSION

The purpose of this chapter was to provide a summary of the results of the study in comparison to the literature found throughout the investigation. The first part of this chapter highlighted the factors that have implications on the bottom-up performance of the business. This study has presented vital information relating to best operational practices that should be implemented in manufacturing industries. It has proved that variables, such as production planning, production scheduling, lead time delivery and first to market can positively improve the performance of manufacturing industries. This study has also briefly highlighted other factors, which can be considered by management to drive efficiencies throughout the production plan. The results confirm that production planning can be used as a risk avoidance technique by ensuring that production is carried out efficiently and minimising waste and costs related to production job changeovers. The study could also contribute to increasing the literature in lean manufacturing and production excellence. The recommendations stated in the study are of value to production planners, production managers, general managers and supply chain practitioners in the manufacturing field. This study also enlightens managers in this industry to identify areas of improvement in their production process and apply beneficial strategies for production improvement.

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ANNEXURE A

Vaal University of Technology

Thank you for paying attention to this academic questionnaire. The purpose of the study is to examine the influence of production planning on business performance as a risk management technique in the manufacturing industry. The research is purely for academic purposes and the information will be kept confidential. It will take you approximately 10 minutes to complete the whole questionnaire

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SECTION A

General Information

The section is asking the background information of the company. Please indicate your answer by ticking (✓) on the appropriate box.

Profile of company

A1: Gender

Male	
Female	

A2: Marital Status

Married	
Single	

Widowed	
Divorced	
Engaged	

A3: Age group

25-less		48-58	
26-36		59-69	
37-47		70+	

A4: Race

Black		White	
Indian		Coloured	

A5: Languages

English		Afrikaans	
Sotho		Zulu	
Setswana		Venda	
Tsonga		Ndebele	
Xhosa		Pedi	
Other			

A6: Number of employees in the company

1-20		63-83	
21-41		84-104	
42-62		105+	

SECTION B

Production Planning

Below are statements about supply chain flexibility. You can indicate the extent to which you agree or disagree with the statement by ticking the corresponding number in the 5 point scale below:

1	2	3	4	5
strongly disagree	disagree	moderately agree	agree	strongly agree

Please tick only one number for each statement

To what extent do you agree with the following statement?

PP1	Cost of production for each item is done prior to producing jobs	Strongly disagree	1	2	3	4	5	Strongly agree
PP2	Number of machines, material and orders are known prior to planning	Strongly disagree	1	2	3	4	5	Strongly agree
PP3	Our factors of earliness or delays of a job are known by the planning department	Strongly disagree	1	2	3	4	5	Strongly agree
PP4	Production planning helps us reduce likeliness of job delays.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION C

Production Scheduling

Below are statements about production planning where you are required to indicate the extent to which you agree or disagree with the statement by ticking the appropriate number where:

1=strongly disagree **2=** disagree **3=** moderately agree **4=** agree **5=** strongly disagree

Tick only one number for each statement.

1	2	3	4	5
strongly disagree	disagree	moderately agree	agree	strongly agree

To what extent do you agree with the following statement?

PS1	Our company aims to continuously improve feasibility of production schedules	Strongly disagree	1	2	3	4	5	Strongly agree
PS2	Production scheduling is a critical part in the manufacturing department	Strongly disagree	1	2	3	4	5	Strongly agree
PS3	Production scheduling performs effectively throughout the manufacturing department	Strongly disagree	1	2	3	4	5	Strongly agree

PS4	Production scheduling actively assists us in meeting our delivery times.	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION D

Lead Time

Below are statements about delivery lead time. You may agree or disagree with each statement by ticking the appropriate number provided where:

1	2	3	4	5
strongly disagree	Disagree	moderately agree	agree	strongly agree

Please tick only one number for each statement

LT1	Our company's logistics department schedules deliveries using planned lead time target from manufacturing	Strongly disagree	1	2	3	4	5	Strongly agree
LT2	Our company uses a 3PL logistics company to reduce delivery lead times	Strongly disagree	1	2	3	4	5	Strongly agree
LT3	Our company aims to minimize time between order placement and order delivery	Strongly disagree	1	2	3	4	5	Strongly agree
LT4	Our company is able to respond quickly to customer orders	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION E

First to Market

Below are statements about first to market. You may agree or disagree with each statement by ticking the appropriate number provided where:

1	2	3	4	5
strongly disagree	disagree	moderately agree	agree	strongly agree

Please tick only one number for each statement

FTM1	Our company delivers product to market quickly	Strongly disagree	1	2	3	4	5	Strongly agree
FTM2	Our company's time to market is lower than the industry average	Strongly disagree	1	2	3	4	5	Strongly agree

FTM3	Our company's product development function influences the speed of new product to the market	Strongly disagree	1	2	3	4	5	Strongly agree
FTM4	Our company is always the first in the market to introduce new products	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION F

Business Performance

Below are statements about business performance. You may agree or disagree with each statement by ticking the appropriate number provided where:

1	2	3	4	5
strongly disagree	disagree	moderately agree	agree	strongly agree

Please tick only one number for each statement

BP1	Our company aims to improve quality of products produced	Strongly disagree	1	2	3	4	5	Strongly agree
BP2	Our company aims to maximise capacity utilisation in manufacturing	Strongly disagree	1	2	3	4	5	Strongly agree
BP3	Our company monitors resource utilisation rate	Strongly disagree	1	2	3	4	5	Strongly agree
BP4	Our company regularly introduces a numbers of production improvement systems and production flexibility	Strongly disagree	1	2	3	4	5	Strongly agree

THE END

THANK YOU!!