

KEY SUCCESS FACTORS IN THE IMPLEMENTATION
OF PRODUCTION PLANNING: A CASE STUDY OF A
MULTINATIONAL ENGINEERING COMPANY IN
MALAYSIA

BY

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(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Sole contribution has been made by me in completing the FYP.

(4) The word count of this research report is 11286 words

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PREFACE

The completion of this final year project (FYP) is a compulsory requirement for the conferment of the Bachelor of International Business (Honours) certificate by Universiti Tunku Abdul Rahman (UTAR). This research is conducted on the topic: ‘Key Success Factors in the Implementation of Production Planning: A Case Study of a Multinational Engineering Company in Malaysia’. The idea for this research emerged from my experience during my previous internship in the Malaysian manufacturing industry. I completed my internship in the Order Desk and Planning department; a role directly related to the planning function. This practical experience cultivated a strong interest in understanding the key success factors that influence the successful implementation of Production Planning and Control in a global engineering company. While many prior studies have examined the key success factors that influence the successful implementation of Production Planning and Control in other countries, the author was inspired to investigate these factors specifically within a multinational engineering company operating in Malaysia. Therefore, this study aims to contribute to the existing body of knowledge by providing a regionally focused investigation into this crucial operational domain.

Key Success Factors in the Implementation of Production Planning: A Case Study of a Multinational Engineering Company in Malaysia

ABSTRACT

Malaysia's growing emphasis on sustainability and advanced manufacturing has positioned the country as a strategic hub for industrial innovation in Southeast Asia. In alignment with national sustainability goals, multinational companies are increasingly integrating sustainable practices into their operations. This study investigates the key success factors that facilitate effective planning and control in enhancing organizational efficiency and long-term competitiveness. The findings contribute to a deeper understanding of how manufacturers strengthen planning and control capabilities. A qualitative case-based research design was employed, utilizing semi-structured interviews with eight personnel across functional roles including operations, planning and quality located in Sendayan TechValley Industrial Park, Negeri Sembilan. The insights gathered provide a grounded understanding of how strategic planning and control mechanisms are implemented and adapted to meet sustainability imperatives. The findings contribute to both academic and practical perspectives by highlighting how manufacturers can strengthen their planning and control capabilities to align with evolving sustainability-driven industrial landscapes. As a result of the findings, six key themes were identified as critical to the successful implementation of Production Planning and Control (PPC). However, the study is constrained by its geographical focus and the potential for varying interpretations among participants, which may influence the generalizability of the outcomes. Despite these limitations, the findings offer valuable insights into PPC practices and provide a practical roadmap for industry decision-makers seeking to develop robust and effective PPC systems that support sustainability-driven manufacturing environments.

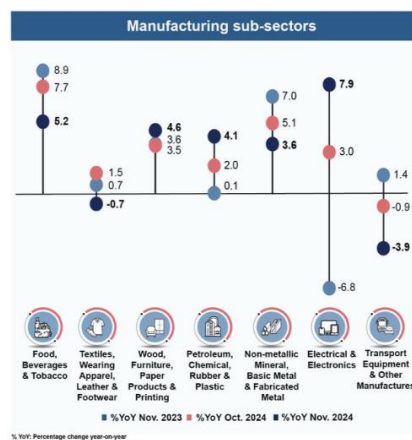
Keywords: Production Planning and Control, sustainability manufacturing, supply chain management

CHAPTER 1:INTRODUCTION

1.1 Background of the Study

While the manufacturing industry has been a driving force in Malaysia's economic prosperity, it faces significant challenges. According to the Malaysian Investment Development Authority, manufacturing sector contributed 23.4% to Malaysia's GDP, a marginal growth compared to previous years. The manufacturing sector remains one of the important drivers for Malaysia in 2023 (Malaysia Investment Development Authority, 2024a), further highlighted by a 5.5% increase in value-added GDP to RM 97.4 billion in Q3 2024 (Malaysia Investment Development Authority, 2024b). Five states in Malaysia experienced growth rates that above the national level, with Negeri Sembilan and other key areas playing an important part in supporting the growth of the industrial sector and contributing significantly to the national economy (MIDA, 2024a). Manufacturing sales increased 4.5% year on year to RM 161.9 billion in November 2024 (Salim, S. 2025). Food, beverage, and tobacco, wood, furniture, paper products, and printing, non-metallic mineral basic metal, and fabricated metal are all growing industries. Figure 1.1 demonstrated that textiles, wearing clothes, leather and footwear, transportation equipment, and other firms have exhibited a reduction in sales.

Figure 1.1:Sales Malaysia by Sectors



Source: Salim,S (2025). *Malaysia's industrial output grew faster than expected at 3.6% in November*. The Edge Malaysia Publisher

Additionally, manufacturing sector plays an important role in employment, accounting for over 2.3 million jobs, 24% of the Malaysia's workforce across industry such as agricultural, mining and quarrying, manufacturing, construction and service sectors (Sofiah, A. 2023). In the first quarter of 2025, employment in the manufacturing industry reached by 1.5% year on year to 2.494 million positions, with 95.5% filled and 4.5% unfilled, while 12,100 new jobs were created (The Edge Malaysia, 2025). Malaysia's goals to create more than 700,000 new jobs opportunities and 500,000 career opportunities in the next five years (Iskandar & Seraj, 2025).

Production Planning and Control (PPC) is one of the most important departments in an organisation because it performs activities of planning, coordination, and control of production and services using system and tools (de Souza Costa et al., 2021). Production planning is a critical process in manufacturing industries that requires effective implementation to ensure that the process of the production operates smoothly, are scheduled in a timely manner and align with organization's strategy objectives (Mahendrawathi et al., 2018). According to Tang & Naim (2004) and Towill et al. (2007), a crucial factor for the successful implementation of control mechanisms in Production Planning and Control (PPC) system such as cancellation, new orders addition, change in order priority and adjustment to processing order is the PPC system's capacity to deliver information transparency to the decision makers at the time of perceived information needed.

Production Planning and Control (PPC) act as a key factor that contribute to sustainable manufacturing (Zarte et al., 2022). Past studies advocated the significance of sustainable manufacturing in several areas that include product development, quality control, resources and planning and control (Gonzalez et al., 2012). The rapidly growing world population and the increasing demand for consumer products have put a greater pressure on manufacturing industries (Linke et al., 2013). Manufacturing activities require demand a large quantity of energy and natural resources (Linke et al., 2013), which results in increased emissions to the air and land, affecting society and the economy. The inefficiencies often cause undesirable effects such as excessive waste, CO2 emissions, energy consumption (Zarte et al., 2019).

Several variables contribute to the sustainable development of production companies such as various groups of stakeholders, environmental activism, government, availability of raw materials, rising energy costs or the shortage of skilled workers (Trost et al., 2019). A product in a company is sustainable only if it is manufactured in a true sustainable way (Inoue et al., 2012). The impact such as financial losses, environmental damage and social issues can be identified and avoided during the production planning lifecycle phase (Vorderwinkler & Heiß, 2011). Sustainable PPC process usually focus on environmental and economic aspects such as energy planning, waste management or their respective costs and environmental impact (Giret et al., 2015) but neglect the social aspects (Gbededo et al., 2018). However, social aspect has become increasingly important for a company including the working conditions at the workplace (Zarte et al., 2019). As a result, there is a growing need to adopt sustainable manufacturing processes, which aim at minimizing the negative impact on the environmental and enhancing operational efficiency (Malek & Desai, 2020).

1.2 Background of the Case Company

The case examined in this study is Company A, a Stockholm, Sweden-based high-tech engineering plant located in Malaysia. Company A was established in 2023 and today ranks among the leading firms in attracting international and local investors, while also creating job and business opportunities. Company A is located within a modern technology park with an excellent infrastructure network. This park emphasizes sustainability, renewable energy, new technology, and advanced communication services and facilities, reflecting the company's commitment to operational efficiency and long-term growth through modern and sustainable practices. This location enhances Malaysia's appeal for high-tech investment, facilitates technology transfer, and generates highly skilled employment opportunities.

The company manufactures industrial engineering products, including heavy machinery and engineering equipment, that cater to sectors such as manufacturing, mining, and infrastructure. Company A specializes in producing and supplying a wide range of underground load and mining equipment, and significantly, it is

considered the first in the world to manufacture automated battery-electric vehicles (BEVs). The company has committed an investment projected to reach SEK 350 million in Malaysia over the next three years, a move driven by the growing global demand for battery-electric vehicles (BEVs) in the mining industry.

The company primarily serves customers across the Asia-Pacific region such as Australia and Indonesia, offering high-quality, reliable equipment and reducing product lead times through localized production. The company's strategic objectives include developing a strong local supplier network, supporting assembly production for underground loaders and trucks, and scaling up the manufacturing of battery-electric vehicles (BEVs). The company intends to produce 300 units each year, with BEVs accounting for 50% of the total. In 2024, the company expects to have 400 to 500 employees in the factory, up from 50 currently.

1.3 Company Production Planning and Control (PPC) Activities

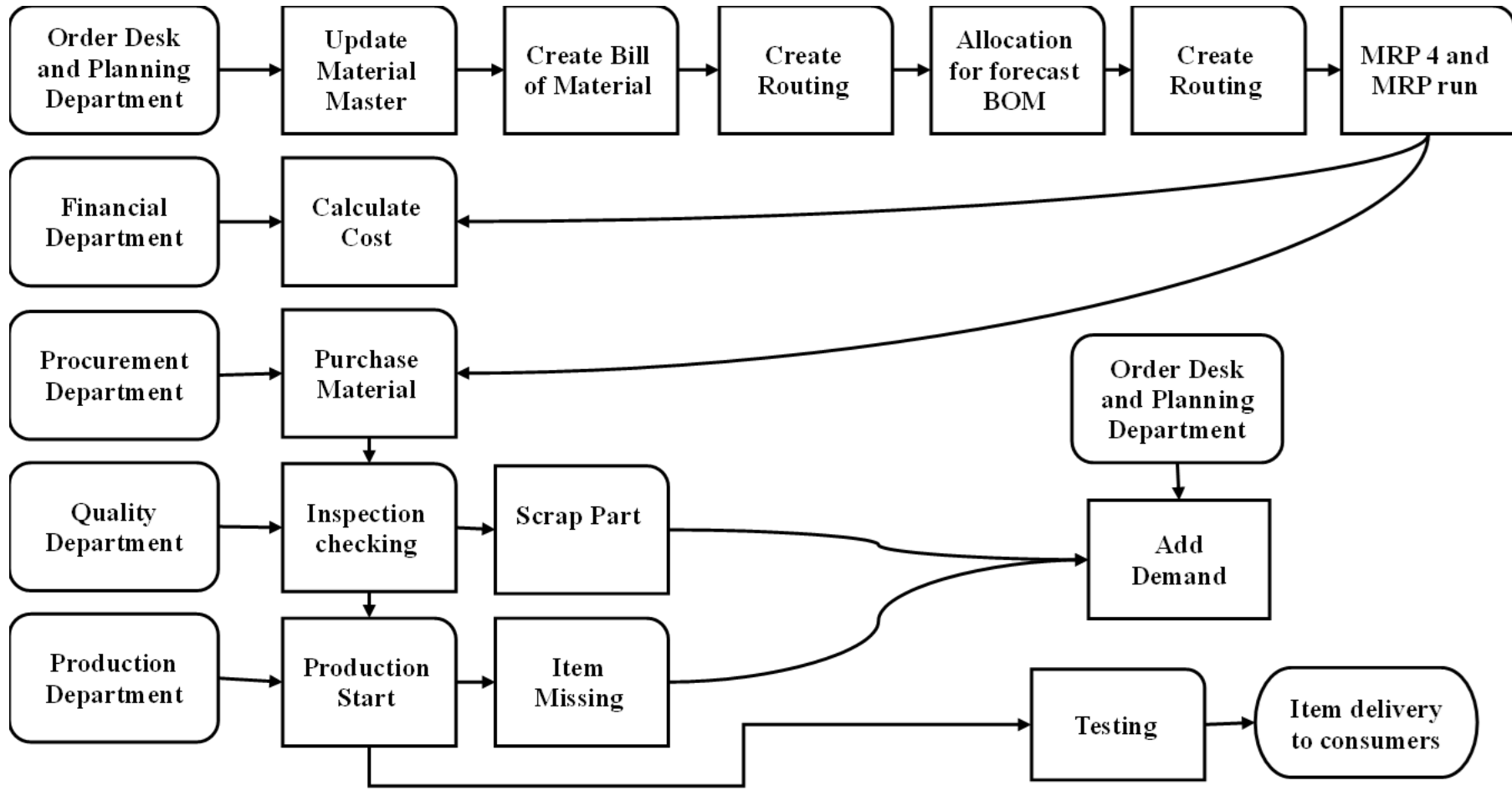
The system highlights a range of interdependent tasks distributed across departments in terms of activities. These include planning activities (material master updates, BOM creation, routing creation), procurement activities (purchasing, material acquisition), financial activities (cost calculation), quality assurance activities (inspection, scrap classification), and manufacturing, testing, and delivery. The coordination of these processes creates an organized mechanism for fulfilling customer orders while also incorporating corrective steps when problems occur.

The company's Production Planning and Control (PPC) activities begin with the DSB meeting, during which customer requirements are discussed and formalized into customer orders. These orders are subsequently recorded into the SAP system, ensuring accurate documentation and seamless integration. The Order Desk and Planning Department conducts a variety of planning duties, such as updating the material master, preparing the bill of materials (BOM), and determining routing details. At this level, activities include part allocation for the forecast BOM as well

as the execution of an MRP run, which provides data for further procurement and finance activities.

The Procurement Department is in charge of procuring the materials specified in the MRP results. In parallel, the Financial Department calculates production costs to ensure financial monitoring. After materials are obtained, the Quality Department conducts quality-checking activities. Items that fail inspection are classified as scrap, which sends information to the Planning Department to modify demand. Approved products are routed to the Production Department, where production start-up activities are carried out, followed by product testing to assure reliability. The final step in this cycle is delivering goods to consumers. When issues arise, further activities are required. Scrap parts and missing goods, for example, trigger feedback actions will be pushing the Planning Department to adjust demand requirements. Such feedback initiatives ensure that errors and shortages are corrected quickly. The company's Production and Planning Control activities is shown in Figure 1.2.

Figure 1.2: Company's Production Planning and Control Activities



Source: Developed for the research

1.4 Problem Statement

The manufacturing sector is changing quickly as companies work to stay competitive in an increasingly complex environment. Many organisations face growing pressure to improve efficiency, maintain reliable operations, and secure long-term performance while dealing with fast-shifting customer needs and frequent disruptions. Despite efforts to modernise, manufacturers still encounter challenges such as weak coordination, inconsistent processes, and planning gaps that affect their ability to respond effectively to operational issues. These challenges highlight the importance of strengthening Production Planning and Control (PPC) to support stability, competitiveness, and sustainable growth.

Business in manufacturing is facing greater challenges and pressures to stay competitive in the market place (Joung et al., 2013). Many studies have been conducted to evaluate the economic and social of manufacturing in different location of the world (Garetti & Taisch, 2012). While the long-term consequences such as financial losses, environmental harm, and social issues are obvious (Zarte et al., 2019), current Production Planning and Control (PPC) methods often focus primary on economic and environmental sustainability which frequently missing the social aspect (Gbededo et al., 2018; Giret et al., 2015). This gap emphasized the need to explore the major success criteria for the effective implementation of sustainable PPC procedures that account for all aspects of sustainability.

According to Federation of Malaysian Manufacturers-Malaysia Institute of Economic Research (FMM-MIER), nearly 40% of Malaysian manufacturer are projected to remain sustainable for less than one years in 2025, highlighting a critical vulnerability of the sector. The manufacturing industry contributes approximately 23% to 25% of GDP and account for up to 85% of total export, highlight its crucial roles in the country's economic stability (Federation of Malaysia Manufacturing, 2025). Recent reports by Kang S.L (2019) and Business Today (2025) identify several structure pressures including intense competition, oversupply of capacity, volatility on fuel price and foreign exchange, weaker operating condition, input cost pressure and crew shortage as key factors affecting

effective production planning. These challenges indicate that Malaysia manufacturer may lack of robust Production Planning and Control (PPC) system to maintain efficiency, competitive, and long-term sustainability.

Production Planning and Control (PPC) remains ambiguity regarding the contextual factors that drive its implementation within manufacturing companies. Prior studies have identified influences such as organizational culture, firm size, availability of skilled personnel, lifecycle stage, structural centralization, technology adoption, competitive strategy, and environmental uncertainty (Al-Mawali, 2015; Otley, 2016). However, the extent to which these factors affect PPC usage is still argued, as findings remain inconsistent across studies (Ahmad & Mohamed Zabri, 2015; Oyewo et al., 2022). This unresolved debate highlights the need for further empirical investigation to better understand how contextual factors shape PPC implementation and effectiveness.

A gap exists between industrial practice and the current literature on production planning and control (PPC), mainly due to the theoretical focus of existing studies (Lane & Szwejczewski, 2000). Smith review of over 150 papers on knowledge-based approaches highlighted a clear lack of practical implementations. Although technological progress justifies theoretical exploration, the use of abstract Operations Research models has inherent limitations because they frequently fail to capture the complex interaction between tasks, human involvement, and organizational policies (Lane & Szwejczewski, 2000). Therefore, it is crucial to examine the key factors that influence PPC effectiveness in practice in order to bridge the gap between theory and industrial application.

A review of previous studies on production planning and control (PPC) reveals significant research across countries in different industries such as Brazil, China, UK, Germany, Nigeria and Indonesia (Bernardes, 2002a; Feng et al., 2011; Lane & Szwejczewski, 2000; Oyewo et al., 2022; Sagawa & Nagano, 2021; Schuh et al., 2017; Soto et al., 2016; Wang et al., 2010). However, a significant geographical gap and industrial exists, as Malaysian is not including in PPC research within the industrial engineering sector. The uniqueness of Malaysia, such as labour availability, cultural perspectives on planning, technological readiness, and supply

chain integration can have a considerable impact on the adoption and effectiveness of PPC (Ahmad Tajuddin et al., 2023; Hussein Zolait et al., 2010; Mustafa et al., 2025). While global findings provide valuable insights, but the relevance to the Malaysian situation remain uncertain. This highlights how importance is the need to carry out localized empirical studies to gain understand into the drivers and success of PPC practices in Malaysian sectors.

1.5 Research Questions

The research question for this study is what are the key determinants behind the successful implementation of Production Planning and Control (PPC) in a global engineering manufacturing company?

1.6 Research Objectives

Based on the research question, the following research objective is defined is to identify the key determinants that contribute to the successful implementation of Production Planning and Control in a global engineering manufacturing company.

1.7 Significance of the Study

This study is important for several reasons especially in improving our understanding of Production Planning and Control (PPC) in Malaysia's manufacturing industry. The study is not well explored in Malaysia industrial engineering in Malaysia although there is a lot of research on PPC in other parts of the world (Oyewo et al., 2024; Sagawa & Nagano, 2021; Schuh et al., 2017), particular in businesses focused on sustainability and advanced manufacturing technologies. This study specifically investigates the implementation of PPC in a multinational engineering company in Malaysia. This research provides useful insights into connecting the theoretical PPC models with its real-world applications in the fast-changing industrial environment.

The study shows the growing importance of sustainable manufacturing in both environmental and economic benefits (Abdul-Rashid et al., 2017; Gunasekaran & Spalanzani, 2012; Zarte et al., 2019). Implementing sustainable manufacturing practices is being recognized for improving the economic performance by reducing cost as material, energy inputs and waste disposal costs have risen dramatically over the past few decade (Despeisse et al., 2012). The need for sustainability in industrial activities is growing due to the factors such as limited non-renewable resources, stricter environmental and occupational safety regulations and the growing consumer preference for eco-friendly products (Jayal et al., 2010). This study seeks to explore what drives companies in Malaysia to adopt sustainable PPC practices and provide practical suggestions for manufacturing businesses.

The results of this study will be helpful to industry leaders in Malaysia's manufacturing sector. The study will help businesses to optimize their production processes, reduce operational expenses and better meet customer requirements by identifying the critical success factor in the implementation of PPC (Hyer, 1982; Kiran, '2019; Pablo Usuga Cadavid et al., 2020). As Malaysia's manufacturing industry faces increasing pressure to adopt sustainable practices (Abdul-Rashid et al., 2017; Ngu et al., 2020), this study will help manufacturers add sustainability to their PPC processes, allowing them to stay competitive in an increasingly global and eco-conscious market.

1.8 Research Layout

This study report is structured into five major sections, providing a clear flow from contextual background to methodological implementation. Chapter 1 offers an overview of Malaysia's manufacturing industry and its significant to national prosperity. The chapter also introduces the case company, highlight its operations, investment, and contribution to the development of modern engineering equipment, such as battery-electric vehicles. Furthermore, this chapter outline the company's production planning and control activities, followed by the problem description, research questions, and objectives that will guide the study.

Chapter 2 examines the relevant literature on Production Planning and Control (PPC). The chapter begins by defining PPC and examining how it has evolved from traditional approaches to advanced enterprise systems. The evaluation then delves into PPC tasks such forecasting, aggregate planning, material requirements planning, capacity planning, scheduling, and inventory control. The characteristics of standard and smart PPC systems are compared, followed by a discussion of the benefits PPC provides in terms of efficiency, cost management, environmental sustainability, and customer satisfaction. The chapter also draws on previous research from various industries and countries to identify critical factors influencing PPC implementation.

Chapter 3 describes the methodology used in the study. The chapter justifies the use of an exploratory, qualitative case study approach to gather in-depth knowledge about PPC implementation based on semi-structured interviews. The research approach is using judgemental sampling with eight participants chosen to ensure that only those with direct responsibilities for production planning and control are included. Furthermore, the chapter outlines the data gathering process, including the establishment of interview protocols, processes, and instruments, as well as ethical considerations including informed consent, confidentiality, and non-disclosure agreements (NDA). It also describes how thematic analysis aided by generative AI technologies (ChatGPT) will be used to code, categorize, and improve topics discovered during the interviews.

Chapter 4 presents a comprehensive analysis of the study's findings, focusing on the responses collected from eight participants to explore the factors influencing the effective implementation of Production Planning and Control (PPC). The analysis is structured around six key themes identified from the qualitative data: robust system and data integrity, management commitment and organizational support, effective material and supply chain management, cross-functional communication and coordination, continuous improvement and adaptability, and a competent and trained workforce. This chapter is organized into four main sections: an introduction, background of the participants, data analysis and conclusion.

Chapter 5 presents a discussion and summary of the results generated in the previous chapter. This chapter is structured to include an introduction, a summary of statistical and qualitative analyses, a discussion of the major findings, the implications of the study, its limitations, recommendations for future research, and the conclusion. By systematically reviewing and interpreting the results, this chapter aims to provide a comprehensive understanding of the factors influencing the effective implementation of Production Planning and Control (PPC) and to highlight their practical and theoretical significance.

CHAPTER 2:LITERATURE REVIEW

2.1 Production Planning and Control (PPC)

Past studies highlight different perspective of Production Planning and Control (PPC) (Afolalu et al., 2021; Hyer, 1982; Pablo Usuga Cadavid et al., 2020; Stevenson et al., 2005). Hyer (1982) highlighted PPC' regulatory role in directing the movement of the raw material within the manufacturing cycle while Stevenson et al. (2005) emphasized its importance in meeting customer demand in a competitive environment. Similarly, Kiran (2019) argued production planning as the "brain and nervous system" of operations, ensuring the proper resources are accessible at the right time and cost. Pablo Usuga Cadavid et al. (2020) emphasized the global aspect, connecting production planning to profitability, productivity, and delivery goals while Afolalu et al. (2021) defined production planning as aligning facilities with market demand and available resources. Collectively, these perspectives imply that production planning and control are strategic and operational tool used to balance efficiency, demand, and maintaining competitiveness. The summary of Production Planning and Control definition in different contexts is shown in Table 2.1.

Table 2.1: Summary of Production Planning and Control Definitions

Author	Years	Definitions
Hyer	(1982)	Directing or regulating the movement of items through manufacturing cycle
Stevenson et al.	(2005)	Meeting high customer demand and expectation in the present, highly competitive and manufacturing climate
Kiran	(2019)	The brain and nervous system of the production program are in control of ensuring that all materials and parts of assembly are available at the right time, at the right place, and in the right quantity to allow operations to proceed according to the predetermined schedule at the lowest possible cost.
Pablo Usuga Cadavid et al.	(2020)	Determining the worldwide quantities required to achieve the commercial plan and the profitability, productivity, and delivery time objectives.
Afolalu et al.	(2021)	Production planning involves determining the necessary production facilities based on available space and market demand for goods and services.

Source: Developed for the research

Previous studies have highlighted the key functions of Production Planning and Control (PPC) (Kiran, 2019; Stevenson et al., 2005; Zgpfel & Missbauer, 1993) Zgpfel & Missbauer (1993) highlighted key responsibilities such as inventory accounting, work sequencing, order release and capacity balancing to endure that operations remain efficient and goal oriented. Stevenson et al. (2005) who identified work-in-progress reduction, throughput time reduction and greater responsiveness to demand variation which leads to reduced costs and elevated delivery performance. Kiran (2019) offers a more detailed definitions, highlighting forecasting, cost estimation, make-or-buy choice, personnel allocation, raw material management and machinery requirements as a critical function. These roles demonstrate that Production Planning and Control (PPC) not only allow the coordination of resources, but also offer insights, flexibility and operational discipline throughout the supply chain. The summary of Production Planning and Control functions in different contexts is shown in Table 2.2.

Table 2.2: Summary of Production Planning and Control Functions

Author (s) / Years	Functions
Zgpfel & Missbauer (1993)	<ul style="list-style-type: none"> • Inventory accounting • Scheduling and sequencing jobs • Plan the requirement quantity of materials • Order release • Controlling the goal performance • Planning and balancing capacities • Determined how much of the final product needed
Stevenson et al. (2005)	<ul style="list-style-type: none"> • Reduce Work in Progress (WIP) • Minimize Shop Floor Throughput Times (SFTT) and lead time • Lower stockholding costs • Improve responsiveness to change in demand • Improve Delivery Date (DD)
Kiran (2019)	<ul style="list-style-type: none"> • Aid forecasting the future for scheduling processes • Aid cost estimation for new job • Decide on make or buy decision • Translate the schedule into manpower requirement • Received order from marketing department • Determine the material requirement • Maintain the raw material requirement • Plan production schedule • Issue production order • Prepare operation process chart • Determine the machinery requirement

Source: Developed for the research

2.2 Production Planning and Control (PPC) Activities

Production Planning and Control (PPC) system generally encompasses a range of essential activities that tend to coordinate workforce, resources, and inter-departmental schedules across the organization (Amrifan Saladin, 2019; Bueno et al., 2020; Cañas et al., 2022; Rahmani et al., 2022; Stevenson et al., 2005; Zarte et al., 2022). Previous research has highlighted important tasks that constitute the basis of Production Planning and Control (PPC). Stevenson et al. (2005) highlighted demand management, material requirements planning, capacity planning, and task

scheduling and sequencing. Amrifan Saladin (2019) emphasized aggregate production planning, master production scheduling, material requirement planning, capacity planning, and shopfloor control, while Bueno et al. (2020) investigated demand forecasting, sales and operations planning, master production scheduling, material requirement planning, and inventory planning and control, demonstrating a broader perspective on Production Planning and Control.

Similarly, Cañas et al. (2022) highlighted the Production Planning and Control activities including demand management, master production scheduling, material requirements planning, capacity requirements planning (CRP), and job scheduling and sequencing. Zarte et al. (2022) identified resource planning, scheduling, work planning, and order release and monitoring as key activities, emphasizing the operational execution and resources allocation aspects of Production Planning and Control. According to Lage & Godinho Filho (2016), the activities of PPC include forecasting, aggregate planning, master production planning (MPS), logistic, ordering system, capacity planning, scheduling as well as and inventory and control. The summary of Production Planning and Control activities in different contexts is shown in Table 2.3.

Table 2.3: Summary of Production Planning and Control Activities

Author / Years	Aggregate / Sales Planning	Capacity Planning	Demand & Forecasting	Inventory & Resource Control	Master Production Schedule (MPS)	Material Requirements Planning (MRP)	Ordering System	Scheduling & Sequencing	Shop Floor Control / Monitoring
Stevenson et al. (2005)		✓	✓			✓		✓	
Lage & Godinho Filho (2016)	✓	✓	✓	✓	✓		✓	✓	
Amrifan Saladin (2019)	✓	✓			✓	✓			✓
Bueno et al. (2020)	✓		✓	✓	✓	✓			
Cañas et al. (2022)		✓	✓		✓	✓		✓	
Zarte et al. (2022)		✓		✓				✓	✓

Source: Developed for the research

2.3 Characteristics of Production Planning and Control (PPC)

Traditional Production Planning and Control (PPC) has been described as hierarchical decision-making processes with planning structured across several horizon including long term, medium term and short term (O’Grady, 1986). At higher level, decision focus on more aggregated issues such as capacity and production rate, whereas lower rate deals with detailed scheduling and dispatching (O’Grady, 1986). O’Grady (1986) also argued that PPC in batch-type environments is highly complex because thousands of works move through numerous machines with varying routing option. Furthermore, PPC has been recognized as information intensive, relies heavily on accurate data regarding capacities, lead time and stock orders (O’Grady, 1986). In additions, previous studies had highlighted the coordination role of PPC, particularly in aligning manufacturing with marketing, finance and management (López-Paredes Valladolid, 2014).

Similarly, Stevenson (2009) highlights the importance of organizational fits, integration across functions such as design and procurement and the and resource optimisation in contexts where manufacturing comprises several machines and complex structures. Dittfeld et al. (2022) argue that PPC design is contingent on production context, distinguishing along several axes, production system (to order vs to stock), long-term planning (capacity vs product design), planning focus (utilisation of capacity vs utilisation of personnel), planning starting point (availability of capacity vs availability of materials) and operational constrains such as feasibility of pausing (problematic vs possible) and reworking fault (rarely possible vs possible). Overall, these studies demonstrate the traditional PPC is goal oriented and seek to balance resources, reduce bottlenecks and sustain throughput while being calibrated to the structure and constrain of the specific production system (Dittfeld et al., 2022; López-Paredes Valladolid, 2014; O’Grady, 1986; Stevenson, 2009). A summary of traditional Production Planning and Control characteristics in different context is shown in Table 2.4.

Recent advancements have introduced a shift towards smart PPC (Bendul & Blunck, 2019). Past studies indicate that smart PPC improves these foundations by incorporating real time data management, dynamic planning and replanning and autonomous control (Bueno et al., 2020; Oluyisola et al., 2022; Rahmani et al., 2022; Saad et al., 2021). According to Bueno et al. (2020), PPC characteristic include real-time data management, visibility and traceability, adaptability, smear scheduling and autonomy. In the same vein, Saad et al. (2021) reported that dynamic production planning, autonomous execution control and real time data management. Oluyisola et al. (2022) highlighted agility, telemetry integration and dynamic replanning while Rahmani et al. (2022) identified continuous learning and autonomous production control as the characteristic of PPC. A summary of smart Production Planning and Control characteristic in different context is shown in Table 2.5.

Table 2.4: Summary of Traditional Production Planning and Control Characteristics

Authors (s) /Years	Characteristic
O'Grady (1986)	<p>Hierarchical decision making</p> <ul style="list-style-type: none"> • PPC is structured by levels/horizons: long term, medium-term, short-term planning. • At higher levels, decisions are more aggregate: capacity, aggregate production rates; lower levels deal with detailed scheduling / dispatch <p>High Complexity in Batch Manufacturing</p> <ul style="list-style-type: none"> • The author points out that in batch-type environments, thousands of different jobs flow through hundreds of machines, and routing options vary. This makes planning very complex. <p>Importance of Data (Capacities, Lead Times, Stocks)</p> <ul style="list-style-type: none"> • PPC is information intensive and relies on accurate resource and status data. <p>Goal-oriented</p> <ul style="list-style-type: none"> • PPC aims to balance resources, reduce bottlenecks, and maintain efficient throughput.
López-Paredes Valladolid (2014)	<p>Coordination across function</p> <ul style="list-style-type: none"> • PPC (especially Master Production Planning) ensures alignment among manufacturing, marketing, finance, and broader management. It acts as a coordination tool <p>Forecasting</p> <ul style="list-style-type: none"> • <u>Planning for the future</u>

	<ul style="list-style-type: none"> • Simulation of capacity requirements for different marketing forecasts, purchasing of new equipment, and profit or loss forecasts.
	<p>Balancing resource capacity & demand</p> <ul style="list-style-type: none"> • Ensuring that manufacturing capacity, workforce, machinery, and other resources are neither underutilized nor overloaded.
Stevenson (2009)	<p>Human-Centric</p> <ul style="list-style-type: none"> • PPC required rational decision and standard rule following organizational Fit • PPC concept is a good fit between the characteristic in the organisation in terms of shop configuration and volume /variety. <p>Integration and Coordination</p> <ul style="list-style-type: none"> • Pre-production includes various department such as design and engineering, process planning, and the procurement of customer- specific componets. <p>Data-Driven</p> <ul style="list-style-type: none"> • PPC required more data than is routinely available in many SMEs and MTOs. <p>Resources Optimization</p> <ul style="list-style-type: none"> • Production may take place on many parallel machines; setup may take place offline and product structure may be complex
Dittfeld et al. (2022)	<p>Production system</p> <ul style="list-style-type: none"> • To order vs to stock <p>Long term planning</p> <ul style="list-style-type: none"> • Capacity vs product design <p>Planning focus</p> <ul style="list-style-type: none"> • Utilization of capacity vs utilization of personnel <p>Starting point planning</p> <ul style="list-style-type: none"> • Availability of capacity vs availability of material <p>Pausing planning</p> <ul style="list-style-type: none"> • Problematic vs possible <p>Reworking fault</p> <p>Rarely possible vs possible</p>

Source: Developed for the research

Table 2.5: Summary of Smart Production Planning and Control Characteristics

Author (s)/Years	Characteristic
Bueno et al. (2020)	<ul style="list-style-type: none"> • Real-time Capabilities • Adaptability and dynamicity • Visibility and traceability • Autonomy • Smart Scheduling
Saad et al. (2021)	<ul style="list-style-type: none"> • Dynamic Production Planning • Real-time data management system • Autonomous execution control
Oluvisola et al. (2022)	<ul style="list-style-type: none"> • Dynamic Replanning • Real time demand and production system data • Agility • Telemetry Integration
Rahmani et al. (2022)	<ul style="list-style-type: none"> • Real time data management • Dynamic production planning and replanning • Autonomous production control • Continuous learning

Source: Developed for the research

2.4 Benefits of Production Planning and Control (PPC)

A number of studies have investigated Production Planning and Control as an important technique for improving production (De Oliveira Neto & Lucato, 2016; de Souza Costa et al., 2021; Feng et al., 2011; Hendry et al., 2013; Klöber-Koch et al., 2017; Oliveira Neto et al., 2018b; Rahmani et al., 2022). The literature on Stevenson et a Sriram, C. L., King, J. C., Mertus, J. A., Martin-Ortega, O., & Herman, J. (2009). Surviving field research. Working in Violent and Difficult Situations. 1. (2005) highlighted the importance of PPC in meeting expanding customer demands, while Feng et al. (2011) associated an improvement in PPC to increased manufacturing efficiency, cost savings, and competitive advantage. One significant advantage of PPC is its ability to increase eco-efficiency by optimizing resource use, eliminating waste and reducing energy consumption, hence lowering the environmental footprint of manufacturing process (De Oliveira Neto & Lucato, 2016; de Souza Costa et al., 2021).

Companies can boost their level of productivity and ecological impact by focusing on both operational efficiency and environmental sustainability (De Oliveira Neto & Lucato, 2016; de Souza Costa et al., 2021). Klöber-Koch et al. (2017) has argued that PPC as a sequencing and scheduling mechanism that helps to reduce risk in manufacturing, while Oliveira Neto et al. (2018a) pointed to workload control as a way for PPC can increase the output with fewer raw materials, thereby reducing energy and water consumption. Afolalu et al. (2021) reported that PPC's raise customers satisfaction, reduce rush orders, enhance equipment efficiency and preserve workplace morale while also providing an alternative plan for emergency situations. Rahmani et al. (2022) argued that smart PPC system extend these benefits by allowing for dynamic product data updates, better product variation management. and enhancing demand forecasting. The summary of Production Planning and Control benefits in different contexts is shown in Table 2.6.

Table 2.6:Summary of Production Planning and Control Benefits

Author	Years	Benefits
Stevenson et al.	(2005)	PPC can be seen as a crucial means of meeting the increasingly high expectation and demand of the customer.
Feng et al.	(2011)	Improvements in PPC are associated with increased production efficiency, lower production costs, and sustained competitive advantage.
De Oliveira Neto & <u>Lucato</u>	(2016)	Production Planning and Control (PPC) enhances eco-efficiency by efficiently controlling production processes and cutting down on resources waste, energy use and minimizing the impact of manufacturing on the environment.
<u>Klöber-Koch</u> et al.	(2017)	PPC can be defined as a type of sequencing or machine scheduling that helps to reduce risk in manufacturing situations.

Oliveira Neto et al.	(2018)	PPC can support strategic measures that increase production with fewer resources through workload control (WLC), resulting in lower energy and water use.
Afolalu et al.	(2021)	PPC improves customer service, eliminates rush orders, promotes equipment efficiency, minimizes idle time, boosts factory morale, improves public image and lowers capital requirements. Furthermore, PPC creates backup plans for emergency situations.
de Souza Costa et al.	(2021)	PPC help to reduce environmental impact while also stimulating economic growth by decreasing waste, utilizing renewable resources, and supporting material recovery, remanufacturing, and recycling.
Rahmani et al.	(2022)	Smart PPC enables businesses to gather, retain and modify product data information, creating dynamic changes and more efficient replanning. A more in-depth evaluation of products families makes it easier to manage a huge number of product variations. PPC allow organizations to access real-time demand data, which enables them to predict, control, and react more effectively to requirement of forecasting.

Source: Developed for the research

2.5 Factor of implementation Production Planning and Control (PPC)

The literature reviews highlight a number of factors that contribute to the successful implementation of Production Planning and Control in different industries. One of the most significant factors is uncertainty and risk management, which has been widely discussed in numerous studies (Bernardes, 2002a; Oyewo et al., 2024; Sagawa & Nagano, 2021; Wang et al., 2010). These studies emphasize the importance of addressing environmental uncertainty, project complexity and risk management which may influence the flow of production, as well as strategic adaptive planning. The role of strategic orientation and market responsiveness is

closely tied to a company's business strategy, market focus and perception of environmental instability as highlighted by Oyewo et al. (2024) in relation to PPC effectiveness. Similarly, Duchessi et al. (n.d.) and Soto et al. (2016) also highlighted the crucial role of top management support in ensuring the successful implementation of PPC.

Furthermore, information and data management are critical for ensuring system quality, integration, integrity and product traceability (Oyewo et al., 2024; Sagawa & Nagano, 2021; Schuh et al., 2017; Wang et al., 2010). Several studies have shown that capacity and resources/material management highlighted the importance of workload control, flexibility, and responsive planning system that strengthen operational adaptability (Hendry et al., 2013; Lane & Szejczewski, 2000; Towers et al., 2005). Moreover, organizations gain from learning and continuous improvement through structured knowledge-sharing practice and methodologies such as Six Sigma (Bernardes, 2002a; Chang et al., 2012). Kakouris & Polychronopoulos (2005) and Mahendrawathi et al. (2018) make a similar point in their study of the importance of ERP system in Production Planning and Control (PPC).

Beyond internal practices, collaboration and partnerships with research institutions promote innovation (Bernardes, 2002a), while recognizing human and organizational emphasize the human dimension of operational performance (Guinery & MacCarthy, 2009; Soto et al., 2016). The optimization method including batch size optimization, provide mathematical and process-driven solution for PPC efficiency (Feng et al., 2011; Wang et al., 2010). Othman et al. (2012) highlighted the role of supply chain factor while Khanh & Kim (2016) emphasized the importance of trained workers in achieving effective Production Planning and Control (PPC). Overall, these categories demonstrate how uncertainty, strategy, information, resources, learning, collaboration, human factor, ERP system, trained workforce, supply chain management and optimization method influence the successful implementation of Production Planning and Control (PPC). The summary of Production Planning and Control factors in different context is shown in Table 2.7.

Table 2.7: Summary of Production Planning and Control (PPC) Factors

No	Author (s) / Years	Capacity & Resource /material Management	ERP system	Collaboration & Partnership	Human & Organizational Factors	Information & Data Management	Learning & Continuous Improvement	Optimization Methods	Strategic & Market Orientation	Supply Chain Management	Trained workforce	Top management	Uncertainty & Risk Management
1	Lane & Szwejc zewski (2000)	✓											
2	Bernard es (2002a)			✓			✓						✓
3	Kakour is & Polychr onopou los (2005)		✓										
4	Towers et al. (2005)	✓											
5	Guiner y & MacCar				✓								

	thy					
	(2009)					
6	Wang et al.		✓		✓	✓
	(2010)					
7	Feng et al.				✓	
	(2011)					
8	Chang et al.			✓		
	(2012)					
9	Othman et al.				✓	
	(2012)					
10	Hendry et al.	✓				
	(2013)					
11	O'Reilly et al.					
	(2015)					
12	Soto et al.		✓			✓
	(2016)					
13	Khanh & Kim				✓	
	(2016)					

14	Schuh et al. (2017)		✓			
15	Mahen drawath i et al. (2018)	✓				
16	Sagawa & Nagano (2021)		✓			✓
17	Oyewo et al. (2024)		✓		✓	✓
18	Duches si et al. (n.d.)					✓

Source: Developed for the research

Previous studies on Production Planning and Control (PPC) span a wide range of industries, methodologies and geographical context, providing valuable insights into its implementation. Case studies have been conducted, such as Bernardes (2002a) in the Brazilian construction sectors, Feng et al. (2011) in a Chinese pharmaceutical plant, Wang et al. (2010) in a UK food industry which highlighted the key factors across different industry and country. Similarly, Hendry et al. (2013) examined make to order manufacturer across aerospace, commercial, textile and food industries, while Schuh et al. (2017) focused on German machinery and equipment firms.

Sagawa & Nagano (2021) investigated both MTO and MTS contract manufacturers in Brazil, highlighting the key factors in the PPC adoption. Complementing this case studies insight, Lane & Szwajkowski (2000) and Chang et al. (2012) adopted survey to capture broader pattern in UK and semiconductor manufacturing firms respectively, while Oyewo et al. (2024) used a survey approach in Nigeria to establish the key factors in the adoption of PPC. Soto et al. (2016) further enriched the literature by combining both case study and survey method in Indonesia construction. The summary of Production Planning and Control across various industries, countries and research method in different context is shown in Table 2.8.

Table 2.8: Summary of Production Planning and Control across Various Industries, Countries and Research Method

Author (s) & Year	Contexts	Country	Research Method
Bernardes (2002a)	Construction company	Brazil (South)	Case Study
Chang et al. (2012)	Manufacturing (semiconductor) company	Not stated	Mixed method
Feng et al. (2011)	Manufacturing (Pharmaceutical) company	China	Case Study
Hendry et al. (2013)	Manufacturing company (aerospace, commercial, textile, food)	Not stated	Case Study
Lane & Szweiczewski (2000)	Manufacturing company	UK	Survey
Ovewo et al. (2024)	Manufacturing company	Nigeria	Survey
Sagawa & Nagano (2021)	Manufacturing company	Brazil	Case Study
Schuh et al. (2017)	Manufacturing (Machinery & Equipment) company	Germany	Case Study
Soto et al. (2016)	Construction company	Indonesia	Mixed method
Wang et al. (2010)	Food industry	UK	Case Study

Source: Developed for the research

2.6 Theoretical framework

In this study, researcher employs a qualitative research methodology using Grounded Theory Method (Glaser & Strauss, 1967). Grounded theory refers to the systematic and structure approach that emphasizes an inductive process, whereby theory is built from the data itself (Corbin & Strauss, 2010). This theory is particular useful in this research for understand the complex social phenomena (Bodgan & Bilken, 2007). Grounded theory was chosen for this research because it enables the observation and understanding of how individuals act, react, take action, and transfer what they have learned for Production Planning and Control (PPC) within their workplace setting (Cresswell, 1998). Furthermore, grounded theory was the

most suitable method to investigate the meaning of the participants assigned to their experiences of their work as they perform their task in Production Planning and Control (Creswell, 2007).

According to Bailey et al. (1999) and Mcghee et al. (2007), there are six criteria that helps to differentiates Grounded theory with others research methods. These includes its aims to generate new theories or concept through qualitative analysis; focus on producing theories that are empirically “grounded” in real-world data; use of pragmatic approach to data analysis; recognized that outcomes are shaped by unequal individuals and dynamic situations; based on open-minded inquiry and allowing flexibility in research designs to accommodate unpredictable participants such as sampling size.

CHAPTER 3: METHODOLOGY

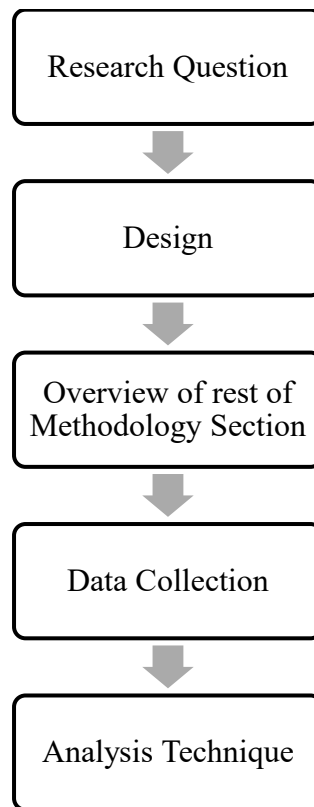
3.1 Introduction

This study utilises an exploratory methodology to obtain clearer understanding of the factors influencing the implementation of Production Planning and Control (PPC). Saunders et al. (2016) defines exploratory research as “finding out what is happening, seeking new insights, asking questions, and assessing phenomena in a new light.” This approach is particularly useful when the study problem is not well defined (Thomas & Lawal, 2020) allowing for an in-depth exploration of the organizational, operational and contextual factor. In contrast, descriptive technique primarily describes trends or conditions but is limited in answering “how” and “why”, the key questions for this research (Siedlecki, 2020). Given these limitations, exploratory research is more suited to determining the root causes of PPC implementation. Furthermore, previous studies in supply chain and operation management have also used this method effectively (Gan & Grunow, 2016; Helo & Hao, 2022; Wiendahl, 2006). Thus, an exploratory framework was selected to ensure that the study can effectively uncover the major determinants in the successful adoption of PPC.

3.2 Study Protocol

The study protocol was created after deciding to adopt a case study approach (Singla & Phadtare, 2025). The study protocol outlines research question, research design, overview of rest of methodology section, data collection and analysis technique (Rashid et al., 2019; Yin, 2009). The first step involves identifying the research questions. The study's research question is: What are the essential factors that contribute to the effective adoption of production planning in a worldwide engineering manufacturing company? A summary of case study research protocol is presented in Figure 3.1.

Figure 3.1:Case Study Research Protocol



Source: Yin (2018) *Case study research: Design and methods*. Sages

3.3 Research Design

This study adopts a qualitative approach to examine the key success factors in the implementation of production planning and control (PPC) within the context of supply chain management (Gammelgaard, 2017). Qualitative research gathers detailed, contextualised information about a phenomenon (Farrugia, 2019) making it well suited to “how” and “why” questions (Yin, 2009). Unlike quantitative methods that rely on numerical data, qualitative research provides a richer, contextualized understanding of the key aspects driving PPC implementation (Siedlecki, 2020). Primary data were collected through semi-structured interviews, allowing participants to explain habits, restrictions, and decision rationales in their own words and enabling the researcher to probe deeper with follow-up question (Saunders et al., 2016). Additionally, open-ended questions encouraged participants to express their viewpoints freely and kept the discussion natural (Leis et al., 2025). A single case study was chosen with a manufacturing company actively engaged in

PPC activities. This case study allowed for a thorough evaluation (Yin, 2018) of the company's internal processes as well as the important drivers driving the implementation of Production Planning and Control.

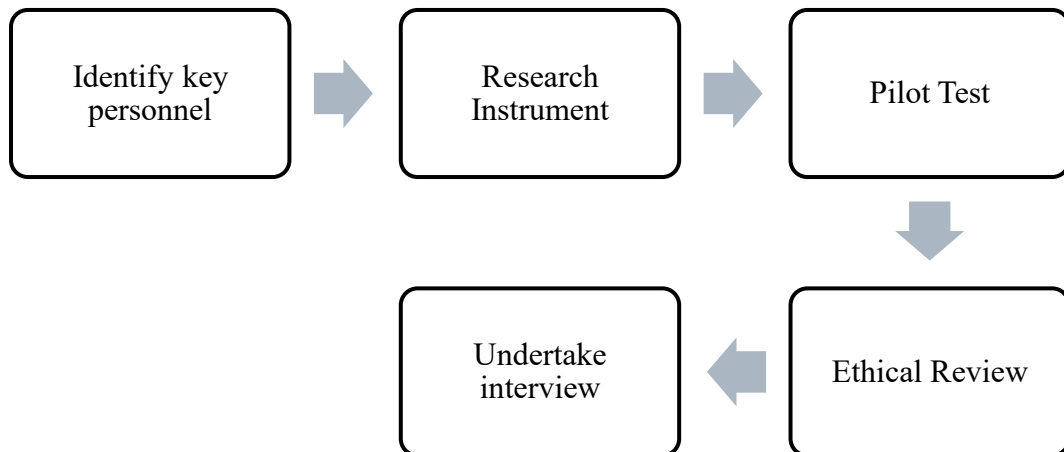
3.4 Sampling Design

The current study used judgemental sampling, with eight people chosen for interviews. Judgemental sampling is common in qualitative research because it allows the researcher to select individual who can provide rich, relevant and related information to the study issues (Patton, 2002). Participants were chosen based on their direct involvement and expertise in Production Planning and Control (PPC). This ensure that each respondent could share valuable perspective from their own roles. This approach is especially helpful in qualitative studies with multiple phases and objectives since it justifies participant selection on analytical, logical or theoretical ground (Berndt, 2020). Judgemental sampling was particular suitable in this study because knowledge of PPC in the organization was uneven distributed. PPC is a specialised job within operations management, hence it is often handled by specific planning departments or operational staff (Gunasekaran & Ngai, 2012). Given the conditions, using random or convenience sampling would have risked selecting persons with insufficient PPC knowledge, decreasing the depth and relevance of the data provided. By focusing on persons with direct PPC responsibilities, the study ensured that the data acquired would be not only rich and relevant, but also believable, thereby increasing the overall validity of the study's conclusions (Farrugia, 2019).

3.5 Data Collection

3.5.1 Interview Process

Figure 3.2: Interview Process



Source: Developed for the research

The number of interviews was determined by two key considerations: the requisite depth of information pertaining to the research concerns, and the extent to which participants' evolving ideas achieve semantic saturation (Creswell & Poth, 2016). Consequently, a total of eight participants were selected for the interview sessions. To ensure transparency in the subsequent analysis, Table 1 is intended to provide a comprehensive overview of each participant's job title and department within the case company. The interviews were scheduled to be conducted face-to-face at the case company during October and November 2025. Each interview is projected to last between 30 and 60 minutes (Grondahl Larsen & Folstad, 2025; Priyan et al., 2025) and will be recorded utilizing Microsoft Teams. A summary of participant's overview in different context is shown in Table 3.1.

Table 3.1:Participant's Overview

Participants	Job Title	Department	Job Scope
P1	Order Desk and Production Planning Manager	Order Desk and Production Planning Department	Manages order scheduling and planning, linking planning decisions to production flow and PPC implementation (Bresler et al., 2020).
P2	Financial Controller and Director	Financial Department	Oversees cost management and financial control, ensuring financial considerations are integrated into PPC implementation (Henttu-Aho, 2016).
P3	Production Manager	Production Department	Coordinates and expedites work and material flows between departments, aligning production efficiency with PPC implementation (Fantozzi et al., 2024).
P4	Production Supervisor	Production Department	The position involves coordinating and expediting work and material flows within or between departments of an organization based on the production schedule (Fantozzi et al., 2024).
P5	Warehouse Supervisor	Logistic Department	Oversees warehouse operations including receiving, storage, picking, packing, and shipping, linking warehouse performance to the effectiveness of PPC implementation (Kembra & Norrman, 2022).
P5	Logistic Manager	Logistic Department	Ensures timely supply of raw materials through logistics and customs management, linking supply chain flow to the effectiveness of PPC implementation (Zipfel et al., 2019).

P6	Quality Manager	Quality Department	Responsible for maintaining quality assurance of raw materials and completed products, ensuring that quality control is directly related to the effectiveness of PPC implementation (Wang et al., 2010).
P7	Engineering Manager	Engineering Department	Designing, developing, testing and evaluating integrated systems for managing industrial production processes (Fantozzi et al., 2024), critical for implementing efficient PPC because it involves significant cost and time investments (Cichos & Aurich, 2016).
P8	Electrical Engineering	Engineering Department	Designing, developing, testing and evaluating integrated systems for managing industrial production processes (Fantozzi et al., 2024)

Source: Developed for the research

The groups included order desk and planning manager, financial controller and director, production manager, production supervisor, warehouse supervisor, logistics manager, quality manager, engineering manager, and electrical engineering.

3.5.2 Research Instrument

The current study used interviews as the primary research instrument. Semi-structured interview questions with open-ended formats were designed in accordance with the study's research objectives, with the purpose of ensuring alignment with the primary success criteria for the implementation of Production Planning and Control (PPC) (Xu et al., 2025) were designed in accordance with the study's research objectives, with the purpose of ensuring alignment with the primary

success criteria for the implementation of Production Planning and Control (PPC) (Young et al., 2018). These questions focused on several critical areas, including the participants' roles and responsibilities in production planning, the integration of planning with overall company operations, the specific practices, tools, and processes that contribute to effective planning, and the success factors that contribute to both efficiency and sustainability. In-depth interviews allowed the researcher to obtain rich, detailed information by enabling the personnel to explain their thought, intentions, and actions (Gioia et al., 2013). In contrast to questionnaires, which are comparatively inexpensive to design, distribute, and analyse, research interviews are more resource intensive. Interview often signal the greater importance attributed to the research topic, as highlighted by Birmingham, P., & Wilkinson, D. (2003).

3.5.3 Pilot Tests

Pilot test was conducted with 2 respondents to check its reliability and efficacy once the interview questions were formulated (Kwatra et al., 2014). Experience practitioners were selected to participant in the pilot study based on the following criteria: having experience in the Production Planning and Control in any area. These experts verified the suitability and alignment of the interview questions with the inquiry of Production Planning and Control (Castillo-Montoya, 2016). The interview questions were revised using the feedback from the pilot test received from the experience practitioners through the “WhatsApp” applications. The pilot study result was then used to finalize the instrument of qualitative operationalisation (Siengthai & Pila-Ngarm, 2016).

3.5.4 Ethical Considerations

Ethical consideration should carry the entire research process (Sriram et al., 2009). According to Nii Laryeafio & Ogbewe (2023), conducting interviews to gather information from participants requires the researcher to prepare four key documents: consent form, an information sheet, an interview guide and an introduction letter especially if the study involves organizations or institutions. Formal approval for the study was obtained from the case company through an official email that

outlined the research objectives, methodology and background. This ensured the company understood the research purpose. The company and researcher signed a non-disclosure agreement (NDA) to protect any proprietary or confidential information that might be shared during the research (Taylor & Land, 2014; Tilley & Woodthorpe, 2011). Voluntary participation was emphasized at all stage of the study to ensure no individual felt pressured to participant (Mumford et al., 2021).

Informed consent was obtained by signing a Personal Data Protection (PDP) form (Nii Laryeafio & Ogbewe, 2023). The agreement made clear that all data gathered during the study would be used only for this research and kept strictly confidential (Crow & Wiles, 2008). This implies that no recognizable data would be provided in any published research or report, and the privacy of the participant would be safeguard (Crow & Wiles, 2008). Interview questions were shared with the company and interviewees to ensure transparency and open communication. Additionally, audio recordings of the interviews were securely stored to maintain participant confidentiality, with access only given to the principal researcher to prevent unauthorized access (Petrova et al., 2016).

3.5.5 Undertake Interview

Face-to-face interviews were conducted with participants at the case company after receiving an official ethical approval. An official email was distributed to all potential participants to arrange interview sessions at their convenience. The interviews were carried out over a period of three days, between 23 October 2025 and 31 October 2025 and were recorded using Microsoft Teams. Each interview session lasted between 25 and 45 minutes. Participants were assured that all information shared would be kept totally confidential and utilized solely for research reasons, thereby cultivating trust and promoting their engagement before initiating each session.

3.6 Research Technique

The qualitative study used generative AI to support data analysis. Artificial Intelligence techniques, such as ChatGPT, used in this study to identify key success

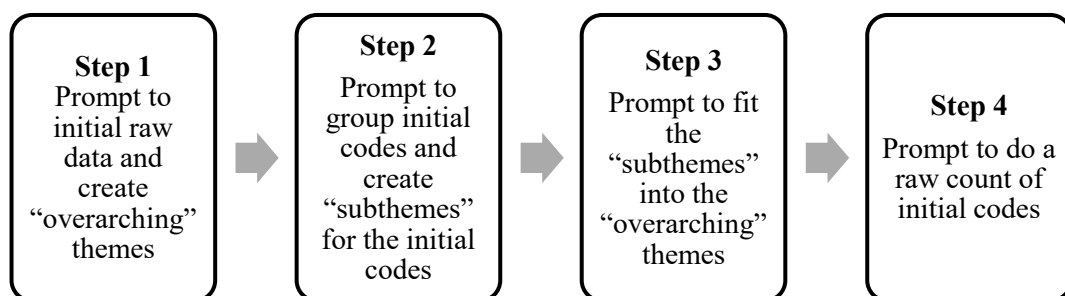
factors in the implementation of Production Planning and Control (PPC) (Morgan, 2023). ChatGPT used to generate initial codes, identifying themes, and refining thematic categories in this study (Qiao et al., 2025) which helping to simplify processes that are often time-consuming and resource-intensive (Goyanes et al., 2025). ChatGPT's user-friendly interface also make it easier to process large amounts of textual data without requiring advance technical skill (Sun et al., 2025). Additionally, ChatGPT used to summarize interview data, suggest coding structure and organized themes using structured prompt (Naeem et al., 2023). For example, a recent study by Sun et al. (2025) employed ChatGPT to analysis hotel guest's delightful experience.

In this study, ChatGPT applied to organize and categorize factors related to Production Planning and Control (PPC). The themes will then be further refined and analysed separately. The integration of ChatGPT enhances research productivity through effective categorization of themes aligned with human interpretation across large datasets (Nguyen-Trung et al., 2024). This compound was prepared by adapting the prompt used by Sun et al. (2025). In the first step, a prompt was utilized to generate initial codes from the raw qualitative data and to identify overarching thematic categories. Interview transcripts from eight participants were compiled into a single PDF document and uploaded to ChatGPT Plus using the prompt “can you analyse the following qualitative data results, based on the following "factor influencing the successful implementation of production planning and control. Attached are the 8 respondents. when analysing, can you identify some initial codes and suggest possible overarching thematic categories?”. Subsequent, to ensure the initial codes fit into the overarching thematic categories a verification step was conducted using the prompt “how do these initial codes fit into the overarching thematic categories you created?”.

The subsequent step involved grouping the initial codes and generating corresponding “subthemes.” This was accomplished using the prompt: “can you sort the raw responses and group them further into narrower "subthemes"? Make sure that these "subthemes" are still within the realm of the overarching thematic categories you created.” The third step involved organizing the identified subthemes within their respective overarching themes by employing the prompt “how to these

“subthemes” fit into the overarching thematic categories you created.” The last steps involved conducting raw count of initial codes with the prompt “organize all the data and present the output that include the overarching themes, the subthemes, the number of counts of raw responses grouped together as initial codes, and the list of all raw responses”. Following this, the data were further examined using the prompt: “organize all the data and present the output that include the overarching themes, the subthemes, the number of counts of raw responses grouped together as initial codes, and the list of all raw responses.” Then, “what can you say about your patterns of the result above? consider the number of responses, the patterns and the categories developed.” Lastly, the following prompt was applied to gain deeper understanding “were there any responses that are unique, interesting, worth-noting, and/or alarming using the lens of manufacturing industry researcher?”

Figure 3.3:Data Analysis using ChatGPT 5.0



Source: Adapted for the research

3.7 Conclusion

The study used a qualitative approach with a single-case study design to explore Production Planning and Control (PPC) implementation. Eight participants were chosen through judgemental sampling including managers and supervisors who were directly involved in PPC to ensure rich and diverse insights. Data collected

using semi-structured interviews which matched research objectives. Ethical steps were taken including formal approval and a Non-Disclosure Agreement (NDA) to protect data and participants. Finally, ChatGPT used to organize codes, categories, and themes more efficiently for data analysis.

CHAPTER 4:FINDING

4.1 Introduction

The results of the thematic analysis contained factors influence the successful implementation of production planning and control in the global engineering manufacturing company related themes as shown in Table 4.1. Within each theme, the sub-themes are listed in descending orders of frequency, from the most to the least common. Six themes were consistent across initial interviews and follows up: robust system and data integrity, effective material and supply chain management, competent and trained workforce, cross-functional communication and coordination, management commitment and organizational support and continuous improvement and adaptability.

4.2 Background of Participant

Information about participants with position, roles and responsibilities and length of interview (minutes) are shown in Table 4.1

Table 4.1:Background of Participants

Participant (s)	Position	Length of Interview (minutes)
P1	Order Desk and Production Planning Manager	29m54s
P2	Financial Controller and Director	29m51s
P3	Production Manager	40m19s
P4	Production Supervisor	33m53s
P5	Warehouse Supervisor	28m8s
P6	Quality Manager	25m36s
P7	Engineering Manager	42m49s
P8	Electrical Engineering	26m32s

Source: Developed for the research

4.3 Research Finding

4.3.1 Competent and Trained Workforce

This theme reflects competent and trained workforce responses to the factors in the successful implementation of Production Planning and Control (PPC) in the global engineering manufacturing company. Saidi-Mehrabad et al. (2013) highlighted the facts related to workers in developing a production plan may significantly affects the productivity and efficiency of manufacturing. Only a few numbers of participants indicated that:

“For this basic training we have conduct for these two years we have four times.” (P3)

“Number one, we have the classroom training. Classroom training is basically a theory. And some of requirement, let's say they do it in the door setting machine, what to do, just all all the classroom activities.” (P3)

Supports from contractors from China as well. So they are experienced in building similar machines in China and for over many years and very quickly.” (P2)

“Because if you don't have enough man, you still can work all time, right? If you don't know how to assemble, basically we have already have can have people from Finland come for China help to teach us how to do.” (P7)

4.3.2 Continuous improvement and adaptability

Bernardes (2002b) mentioned that continuous effort is necessary to maintain and improve their production planning and control in the company. This study found that continuous improvement and adaptability as a factor in the successful implementation of production planning and control. Several interviewees commented that:

“So we we I really need to prepare a recovery plan that seems to be not feasible in our system helps.” (P1)

“We will need to be able to be almost very automated and I think the automation of our processes needs to be clear, so I would say less.” (P2)

“you have to look at other factories, other benchmarks, not necessarily look at a similar factory to us in Turku, but it could be other other other other companies around the world if you look how the production line operates.” (P2)

“we can learn more people from people. From other department sometimes the mistake make me make us more cautious and you know we learn more from the mistake.” (P5)

“If you monitor this breakdown time, then you will know what you will need to. You will know what to be prevent in the next next machine”. (P6)

4.3.3 Cross-Functional Communication and Coordination

A recurrent theme in the interviews was a sense amongst interviewees that cross-functional communication and coordination as other factors in the successful implementation of Production Planning and Control (PPC) in the global engineering manufacturing company. Zerfass & Volk (2018) found that the communications among different department should be empowered as member of the top management in order to make numerous contributions to the achievement of organizational goals. Grunic et al. (2002) also highlighted that two-way symmetrical communications are better than one side communication or persuasion in term of messaging. The overwhelming majority of informants indicated that:

“So of course during all the production, the whole production planning process, we will have multiple issues that the material not right.

Quality problems, late, delays, all these. So this is not a system able to resolve. Of course system able to give us our ERP system, SAP able to give us some signals, just signaling our.

What is the problems looks like and where is the problem coming from? But nevertheless we really need to have our Internal meeting daily or weekly, even monthly report to have those issues.” (P1)

“We have morning updates daily; we have team company team members updates and then weekly we have update for together groups.” (P3)

“Face to face and then discussing what is the current situation, what if we even even I think you know that we have daily morning meeting inside.” (P4)

"To improve production and efficiency of activity, we call it TDC. Teamwork, discipline, communication in order to get this productivity and efficiency improve. This three TDC must be in place. You must work in team. You must work with discipline. If there is a plan, you follow the plan and when this you have problem, you must communicate." (P3)

"The best way currently production we work up with engineering to confirm any kind of of additional parts needed and directly involved with the state to check every meeting." (P5)

4.3.4 Effective material and supply chain management

Further analysis shows that effective material and supply chain management as a driver that influence the successful of Production Planning and Control (PPC). Production Planning (PP) in ERP in supply chain management (SCM), have been the core modules for planning, control and execution of materials, activities and resources in manufacturing and distribution system across the supply chain (Samaranayake & Toncich, 2007). Several participants felt that:

"We without that material, we can't actually start our production at any point, so." (P1)

"So we'll make sure our material is available. Let's say we set a standard of 98 percents. If all the material will release in place, then we ensure that the production is no downtime. Production can get the parts on time so they can start the production by having no excuse to have the waiting and time wasted." (P1)

"But for Sandvik everything we've been scheduled at least four months before. So usually we have times except there are few suppliers that required more than. A six month lead time, so we we need to perform pretty sure wonder before we get confirmation of the production." (P3)

"So for the inventory control, it's more to monitor stock accuracy obviously through cycle counting. And then for apparently we compared the stock through SAP system and then but that's for the inventory control also we have to monitor and manage staging all the components go to productions." (P5)

4.3.5 Management Commitment and Organizational Support

Further analysis of the data reveals management commitment and organizational support is important in driving the successful implementation of Production Planning and Control (PPC). To deal with the complexities inherent in the production planning and control process, hierarchical approach has been used for long time in the increasing complex manufacturing environment that has emerged in fast-moving industries (O'Reilly et al., 2015). Samaranayake & Toncich (2007) indicated that someone with full authority on the steering committee help in making MRP/MRP II a high priority within the company and also promote adherence to formal planning and control method and operational usage. A few interviewees said that:

“Cooperation or the work together from other department from top to down. For example, if a company top management does not really buy what is production planning”. (P1)

“Deliver the results that it act as a coordination or regulator or you can use the words of judge if anything happens. So we need a person to stand up and really take the jobs, whether the outcome is positive or negative.” (P1)

“The planning, they are very they are very they are given high authority. Everything what planning said we have to follow.” (P6)

4.3.6 Robust Systems and Data Integrity

Further analysis shows that robust systems and data integrity plays an important determinant in the successful implementation of Production Planning and Control in a global engineering manufacturing company. Due to the complexity that production is the most complex business process in the company's activities, production planning system is important to improve the effectiveness and competitiveness of the company in the long and short-term (Syreyschikova et al., 2020). Schuh et al. (2017) emphasize that a high data integrity can guarantee effective monitoring and thereby achieving successful decision-making in Production Planning and Control (PPC). The majority of participants stated that:

“For me is critical. In order to run this move, we need to have a system which everybody is looking the same direction, same path, same database. So for me the ERP is quite important.” (P1)

“Your master data behind all of these needs to be maintained very because otherwise then your MRP is not accurate.” (P2)

“So what I can see that it can be visualized easily visualized, but here SAP doesn't provide that particular visualization system.

That's why I will translate those SAP information into my Excel Excel file. Then I can monitor easier. So we will create a Excel manually and do this stock check every day.” (P3)

“It more prefer if you have this or master like the core system. If we have it, if we can rely system everyone can reach out to the same page.” (P5)

4.4 Conclusion

Together these results provide important insights into the drivers on the successful implementation of Production Planning and Control (PPC) in the global engineering manufacturing company. These drivers include robust system and data integrity, management commitment and organizational support, effective material and supply chain management, cross-functional communication and coordination, continuous improvement and adaptability and competent and trained workforce in the interviewees with 8 different positions in the case company.

CHAPTER 5:DISCUSSION AND RECOMMENDATION

5.1 Introduction

This chapter provides a thorough analysis of the elements that contribute to successful implementation of Production Planning and Control, as well as additional analysis of the related implications, limitations, and pertinent recommendations.

5.2 Discussion

The purpose of this qualitative study is to study the factors that act as the drivers that impact the successful implementation of Production Planning and Control in a global engineering manufacturing company. This study's interpretive approach has led to a greater understanding of the factors influencing the adoption of production planning and control. Themes emerge from the interview data around six dimensions of robust system and data integrity, management commitment and organizational support, effective material and supply chain management, cross-functional communication and coordination, continuous improvement and adaptability and competent and trained workforce.

In line with previous literature, as identified by the key personnel, robust system and data integrity (Kakouris & Polychronopoulos, 2005; Mahendrawathi et al., 2018; Oyewo et al., 2024; Sagawa & Nagano, 2021; Schuh et al., 2017; Wang et al., 2010), management commitment and organizational support (Duchessi et al., n.d.; O'Reilly et al., 2015), effective material and supply chain management (Hendry et al., 2013; Lane & Szwejczewski, 2000; Towers et al., 2005) , continuous improvement and adaptability (Bernardes, 2002a; Chang et al., 2012), cross-functional communication and coordination (Guinery & MacCarthy, 2009; Soto et al., 2016) and competent and trained workforce (Khanh & Kim, 2016) came out as important drivers in the PPC.

The finding of the present studies reveals that effective material and supply chain management as the most important drivers on the adoption of successful PPC by

most of the key personnels. This study is in line with the study conducted by (Hendry et al., 2013; Lane & Szwejczewski, 2000; Towers et al., 2005). Material management utilizing the MRP II system assists in controlling the quantity and timing of supplies of raw materials, parts, sub-assemblies, and assemblies to the production operation helps to increase customer service and operation efficiency (Wilson et al., 1994). Key personnel also emphasize that even with sufficient manpower, the production line cannot begin assembling the equipment or product without materials, which could have an impact on the organizations' productivity.

Another finding that stands out from the results reported earlier is robust system and data integrity in line with the literature (Kakouris & Polychronopoulos, 2005; Oyewo et al., 2024; Schuh et al., 2017) including ERP or MRP system utilization, data accuracy and master data governance, digital integration and automation potential and manual workarounds and system limitation. Participants indicated that all processes should be carried out through the Enterprise Resource Planning (ERP) system, as it helps to save time and improve efficiency compared to manual operations. Production Planning and Control has triggered the emergence of ERP system such as MRP in ensuring the production schedules is stable as possible (Mahendrawathi et al., 2018). A study by Kakouris & Polychronopoulos (2005) highlighted the important of ERP systems for helping businesses successfully manage inventory reduction, lower labour costs, and enhance customer service.

Consistent with the study, this research found that participants who reported using cross functional communication and coordination as a driver of successful adoption of PPC. This finding is in line with Soto et al. (2016). According to Guinery & MacCarthy (2009), dynamic communication across planning interfaces enhances the effectiveness of decision-making in PPC. Key personnel in this study emphasized the importance of open communication and collaboration in addressing operational issues. Participants highlighted that planners should actively communicate the challenges they encounter as well as their achievements, ensuring that all departments remain informed about the current production status.

Competent and trained workforce is in line with those of previous studies stated in Saidi-Mehrabad et al. (2013). Develop a multi-skilled worker who can assists with multiple tasks in the organization which could significantly help to increase the

production flexibility (Park, 1991). In all cases, the informants reported that conducting a continuous training helps to deeper a worker's knowledge of producing the products efficiently and effectively which could affect the overall effectiveness of the organizations. By attending the classroom training, on job training and special training provided by the organization, workers would be able to produce the goods quickly and faster.

Concern was expressed about management commitment and organizational support which in line with the past studies stated by (Duchessi et al., n.d.; O'Reilly et al., 2015). Top management support, along with dedicated resources and training, acts as a crucial enabler for the company's planning, information, and control systems (Das et al., 2006). As mentioned by several participants, management support and strong leadership are crucial characteristics that enable leaders to take responsibility and step forward during emergencies. They play a key role in planning appropriately so that all staff can follow the established plan. Without strong leadership and management support, employees may lose direction.

A common view amongst interviewees was that continuous improvement and adaptability which affects the adoption of successful Production Planning and Control in a global engineering company. This finding was in line with the past literature (Bernardes, 2002a; Chang et al., 2012). According to Bernardes (2002a), highlights that continuous improvement and system maintenance should occur across all sites to ensure long-term effectiveness. Several extended features should be introduced in the system such as health safety management and product development planning and control to achieve a more effective production planning and control process. A small number of respondents indicated that there is always room for improvement, such as introducing an operator cockpit that records workers' real-time entries. This would help track the actual amount of time employees spend on building the machines.

This finding implies that the organization can focus its efforts on these key factors to enhance the adoption of Production Planning and Control, which will ultimately increase organizational efficacy and efficiency. Understanding these factors is especially valuable for management when designing strategies, allocating resources, and developing interventions to strengthen the overall PPC system. Furthermore,

the company could develop a more resilient and adaptable production environment by realizing the value of efficient systems, encouraging leadership, efficient supply chain procedures, ongoing development, and a skilled workforce.

5.3 Limitation and Recommendation

The study has certain limitation. First, this study was exclusively conducted in Malaysia, potentially restricting the generalizability of its findings to other geographical situations. Future studies should include the same sectors in different countries and different size of organizations to enhance the finding on the drivers that influence the successful implementation of PPC. A comparison between the global engineering manufacturing company in Malaysia and other countries such as Thailand, China and Indonesia could be done to identify the key success drivers in a different locations and business strategies. Focusing the study on the same sector in different countries might provide a more in-depth understanding of the drivers in more specific guidelines.

The second limitation of this study was its restricted scope, as the research was exclusively conducted within a global engineering manufacturing in Malaysia. to strengthen the findings on the drivers that influence the successful implementation of Production Planning and Control (PPC) system, future study should broaden its participants based. This expansion should include respondents from diverse sectors and organisation of varying size. A comparison between the global engineering manufacturing company and other industry such automative, housing, building, product and furniture, textile or fabricated metal products would be beneficial to identify the key success drivers across different sectors.

The last limitation is that participants in our study may have interpreted Production Planning and Control (PPC) differently. Although all interviewees possess knowledge management experience and adequate understanding of PPC, variations in their interpretations could have influenced our findings regarding the factors affecting PPC. Consequently, the result reflects the respondent's perception rather than objective reality. Future research could involve additional key personnel from various sectors of the manufacturing industry, such as the food and construction industries, and utilize multiple data sources such as surveys and company records

to provide a more comprehensive and accurate understanding of the factors contributing to the current PPC practices.

5.4 Implication of the study

During the past few years, studies have been conducted to investigate the factors influencing the successful implementation in the manufacturing companies in other countries (Bernardes, 2002a; Oyewo et al., 2024; Schuh et al., 2017). But in the context of Malaysia (Sagawa & Nagano, 2021; Soto et al., 2016), there is a lack of studies that investigated the factors influencing the successful implementation of Production Planning and Control on the performance of the organization. Therefore, the results provide a better understanding of the drivers in the context of Production Planning and Control from a theoretical perspective. To the research knowledge, this study is among the first that use interviews to examine the drivers that influence the Production Planning and Control in Malaysia, thus significantly contributing to the local body of knowledge regarding PPC for Malaysia industry.

This study investigated various drivers to study its influence on Production Planning and Control (PPC). Based on the classification of the impact factors found in the study, future researcher can examine the effects of Production Planning and Control (PPC) and validate the findings in various context. Due to the ongoing discussion over the ambiguity of Production Planning and Control, most organization have no idea about the importance of Production Planning and Control (PPC) and its benefits. The finding helps to support and guide the organization particularly manufacturing companies in implementing Production Planning and Control (PPC) for business activities. The identified influencing element for PPC offers decision makers a clear comprehensive on the critical drivers affecting PPC inside the firms.

From a practical point of view, others manufacturing companies can focus on the six driving factors to encourage the utilisation of Production Planning and Control (PPC) in the manufacturing process. The identified factors provide a roadmap for others manufacturing companies to develop a strong and effective Production Planning and Control (PPC) system which could significantly influence the overall company effectiveness and efficiency. These include ensuring robust system

performance and data integrity, fostering management commitment and organizational support, strengthening effective material planning and supply chain coordination, enhance cross-functional communication and coordination, promoting continuous improvement and adaptability and competent and trained workforce. Additionally, those involve in the manufacturing companies can use these insights to develop an organised and systematic approach to PPC, ensuring that planning is not only documented but successfully carry out in the companies. By focusing on these factors, organizational can create a more reliable, effective and resilient production environment that support long term operational performance and strategic goals.

Furthermore, the case company can strengthen its Production Planning and Control (PPC) by prioritizing the six identified driving factors, with cross-departmental collaboration being one of the most critical. Many operational failures arise not from technical constraints but from breakdowns in communication between departments. Enhancing cross-functional coordination ensures that information flows accurately and in a timely manner across procurement, production, logistics, and quality teams. This reduces planning discrepancies, shortens response time to disruptions, and aligns all units toward the same production targets. In practice, this means implementing structured communication channels, regular interdepartmental meetings, shared digital dashboards, and clear accountability mechanisms to minimize misalignment and prevent avoidable bottlenecks in the production process.

5.5 Conclusion

This study intended to investigate the influence of drivers of the successful implementation of Production Planning and Control in the global engineering company in Malaysia. The study has applied qualitative methods to collect data through interviews form the employees in the case company. The study also applied ChatGPT to analyse the result. The result has shown six drivers significantly affect the Production Planning and Control (PPC) in the manufacturing company in Malaysia. The main findings are robust system and data integrity, management commitment and organizational support, effective material and supply chain

management, cross-functional communication and coordination, continuous improvement and adaptability and competent and trained workforce influence the successful implementation of Production Planning and Control (PPC). However, readers need to be cautious in generalizing the results. To further enrich the analysis, we therefore recommend the future studies should include others sample of people for assessing the other drivers.

From this research, I have gained a deeper understanding of how Production Planning and Control (PPC) operates within a manufacturing company and why it is importance. This study has helped me see the overall structure of PPC from planning resources and scheduling production to monitoring workflow and ensuring products are delivery on time. Through this process, I learned how effective PPC contributes to smoother operations, better decision making and improve efficiency across the entire organisations. This study also highlighted how weaknesses in PPC could lead to delays, higher costs and lower productivity. Overall, this research strengthens my appreciation of PPC as a critical function that supports a company's performance and competitiveness.

References

- Abdul-Rashid, S. H., Sakundarini, N., Raja Ghazilla, R. A., & Thurasamy, R. (2017). The impact of sustainable manufacturing practices on sustainability performance: Empirical evidence from Malaysia. *International Journal of Operations and Production Management*, 37(2), 182–204. <https://doi.org/10.1108/IJOPM-04-2015-0223>
- Afolalu, S. A., Ikumapayi, O. M., Ushe, S. A., Ongbali, S. O., Abdulkareem, A., Emeter, M. E., & Iheanetu, O. U. (2021). *The Role of Production Planning in Enhancing an Efficient Manufacturing System-An Overview*. <https://doi.org/10.1051/e3sconf/202130>
- Ahmad Tajuddin, S. A. F. S., Abd Halim, M. S., Foziah, N. H. M., Zain, F. A. M., Abdullah, H., & Abidin, A. F. Z. (2023). An empirical study in assessing the impact of foreign workers on labour productivity in the Malaysian manufacturing sector. *Asian Development Policy Review*, 11(3), 123–135. <https://doi.org/10.55493/5008.v11i3.4905>
- Ahmad, K., & Mohamed Zabri, S. (2015). Factors explaining the use of management accounting practices in Malaysian medium-sized firms. *Journal of Small Business and Enterprise Development*, 22(4), 762–781. <https://doi.org/10.1108/JSBED-04-2012-0057>
- Al-Mawali, H. (2015). Contingent factors of Strategic Management Accounting. In *Research Journal of Finance and Accounting* www.iiste.org ISSN (Vol. 6, Issue 11). Online. www.iiste.org
- Amrifan Saladin, M. (2019). Production Planning and Control System with Just in Time and Lean Production: A Review. *Journal of Mechanical Science and Engineering*, 6(2), 19–27.
- Bailey, C., White, C., & Pain, R. (1999). Evaluating Qualitative Research: Dealing with the Tension between “Science” and “Creativity.” In *Source: Area* (Vol. 31, Issue 2). <https://www.jstor.org/stable/20003972?seq=1&cid=pdf->
- Bendul, J. C., & Blunck, H. (2019). The design space of production planning and control for industry 4.0. *Computers in Industry*, 105, 260–272. <https://doi.org/10.1016/j.compind.2018.10.010>
- Bernardes, M. (2002). *Improving the production planning and control system in a building company: Contributions after stabilization*. <https://www.researchgate.net/publication/228408831>
- Berndt, A. E. (2020). Sampling Methods. *Journal of Human Lactation*, 36(2), 224–226. <https://doi.org/10.1177/0890334420906850>

- Birmingham, P., & Wilkinson, D. (2003). *Using research instruments: A guide for researchers*. Routledge.
- Bodgan, R., & Bilken, S. K. (2007). *Qualitative research for education (5th ed.)*. Allyn & Bacon.
- Bresler, M., Romsdal, A., Strandhagen, J. O., & Oluyisola, O. E. (2020). *Principles and Research Agenda for Sustainable, Data-Driven Food Production Planning and Control*.
- Bueno, A., Godinho Filho, M., & Frank, A. G. (2020). Smart production planning and control in the Industry 4.0 context: A systematic literature review. *Computers & Industrial Engineering*, *149*, 106774. <https://doi.org/10.1016/J.CIE.2020.106774>
- Cañas, H., Mula, J., Campuzano-Bolarín, F., & Poler, R. (2022). A conceptual framework for smart production planning and control in Industry 4.0. *Computers and Industrial Engineering*, *173*. <https://doi.org/10.1016/j.cie.2022.108659>
- Castillo-Montoya, M. (2016). Preparing for interview research: The interview protocol refinement framework. *Qualitative Report*, *21*(5), 811–831. <https://doi.org/10.46743/2160-3715/2016.2337>
- Chang, S. I., Yen, D. C., Chou, C. C., Wu, H. C., & Lee, H. P. (2012). Applying six sigma to the management and improvement of production planning procedure's performance. *Total Quality Management and Business Excellence*, *23*(3–4), 291–308. <https://doi.org/10.1080/14783363.2012.657387>
- Cichos, D., & Aurich, J. C. (2016). Support of Engineering Changes in Manufacturing Systems by Production Planning and Control Methods. *Procedia CIRP*, *41*, 165–170. <https://doi.org/10.1016/j.procir.2015.12.049>
- Corbin, J., & Strauss, A. (2010). Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. In *Canadian Journal of University Continuing Education (3th ed., Vol. 36, Issue 2)*. Sage Publications Inc. <http://ejournals.library.ualberta.ca/index.php/cjuce-rcepupp.1-3>
- Cresswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. SAGE Publications.
- Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches (2nd ed.)*. Sage Publications.

- Crow, G., & Wiles, R. (2008). Managing anonymity and confidentiality in social research: the case of visual data in Community research.
- Crow, G., & Wiles, R. (2008). *Managing anonymity and confidentiality in social research: the case of visual data in Community research.*
- Das, A., Narasimhan, R., & Talluri, S. (2006). Supplier integration-Finding an optimal configuration. *Journal of Operations Management*, 24(5), 563–582. <https://doi.org/10.1016/j.jom.2005.09.003>
- De Oliveira Neto, G. C., & Lucato, W. C. (2016). Production planning and control as a tool for eco-efficiency improvement and environmental impact reduction. *Production Planning and Control*, 27(3), 148–156. <https://doi.org/10.1080/09537287.2015.1089605>
- de Souza Costa, I., Cardoso de Oliveira Neto, G., & Rodrigues Leite, R. (2021). How does the use of PPC tools/activities improve eco-efficiency? A systematic literature review. *Production Planning and Control*, 32(7), 526–548. <https://doi.org/10.1080/09537287.2020.1743890>
- Despeisse, M., Mbaye, F., Ball, P. D., & Levers, A. (2012). The emergence of sustainable manufacturing practices. *Production Planning and Control*, 23(5), 354–376. <https://doi.org/10.1080/09537287.2011.555425>
- Dittfeld, H., van Donk, D. P., & van Huet, S. (2022). The effect of production system characteristics on resilience capabilities: a multiple case study. *International Journal of Operations and Production Management*, 42(13), 103–127. <https://doi.org/10.1108/IJOPM-12-2021-0789>
- Duchessi, P., Schaninger, C. M., & Hobbs, D. R. (n.d.). Strategy and Organization Implementing a Manufacturing Planning and Control Information System.
- Fantozzi, I. C., Di Luozzo, S., & Schiraldi, M. M. (2024). On tasks and soft skills in operations and supply chain management: analysis and evidence from the O*NET database. *TQM Journal*, 36(9), 53–74. <https://doi.org/10.1108/TQM-04-2023-0104>
- Farrugia, B. (2019). WASP (write a scientific paper): Sampling in qualitative research. *Early Human Development*, 133, 69–71. <https://doi.org/10.1016/j.earlhumdev.2019.03.016>
- Federation of Malaysia Manufacturing (2025) Nearly 40% of manufacturers unsustainable for more than 12 months. *Federation of Malaysia Manufacturing*. Retrieved November 31, 2025, from https://www.fmm.org.my/FMM_In_The_News-@-Nearly_40-p-_of_manufacturers_unsustainable_for_more_than_12_months,_says_FM_M.aspx

- Feng, P., Zhang, J., Wu, Z., & Yu, D. (2011). An improved production planning method for process industries. *International Journal of Production Research*, 49(14), 4223–4243. <https://doi.org/10.1080/00207543.2010.547528>
- Gammelgaard, B. (2017). Editorial: The qualitative case study. In *International Journal of Logistics Management* (Vol. 28, Issue 4, pp. 910–913). Emerald Group Publishing Ltd. <https://doi.org/10.1108/IJLM-09-2017-0231>
- Gan, T. S., & Grunow, M. (2016). Concurrent product and supply chain design: a literature review, an exploratory research framework and a process for modularity design. *International Journal of Computer Integrated Manufacturing*, 29(12), 1255–1271. <https://doi.org/10.1080/0951192X.2015.1067908>
- Garetti, M., & Taisch, M. (2012). Sustainable manufacturing: Trends and research challenges. *Production Planning and Control*, 23(2–3), 83–104. <https://doi.org/10.1080/09537287.2011.591619>
- Gbededo, M. A., Liyanage, K., & Garza-Reyes, J. A. (2018). Towards a Life Cycle Sustainability Analysis: A systematic review of approaches to sustainable manufacturing. *Journal of Cleaner Production*, 184, 1002–1015. <https://doi.org/10.1016/j.jclepro.2018.02.310>
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology. *Organizational Research Methods*, 16(1), 15–31. <https://doi.org/10.1177/1094428112452151>
- Giret, A., Trentesaux, D., & Prabhu, V. (2015). Sustainability in manufacturing operations scheduling: A state of the art review. *Journal of Manufacturing Systems*, 37, 126–140. <https://doi.org/10.1016/j.jmsy.2015.08.002>
- Glaser, Barley. G., & Strauss, Anselm. L. (1967). *The discovery of grounded theory : strategies for qualitative research* (1st ed.). Chicago: Aldine.
- Gonzalez, M. E., Quesada, G., & Mora-Monge, C. (2012). *An International Study on Manufacturing Competitive Priorities*.
- Goyanes, M., Lopezosa, C., & Jordá, B. (2025). Thematic analysis of interview data with ChatGPT: designing and testing a reliable research protocol for qualitative research. *Quality and Quantity*. <https://doi.org/10.1007/s11135-025-02199-3>
- Grunic, James. E., Dozier, David. M., & Grunic, James. E. (2002). *Excellent public relations and effective organizations : a study of communication*

management in three countries (1st Edition, Vol. 668). Lawrence Erlbaum Associates, Mahwah, NJ.

Guinery, J., & MacCarthy, B. (2009). Managing key interfaces in production planning and control. *Production Planning and Control*, 20(1), 40–56. <https://doi.org/10.1080/09537280802658535>

Gunasekaran, A., & Spalanzani, A. (2012). Sustainability of manufacturing and services: Investigations for research and applications. *International Journal of Production Economics*, 140(1), 35–47. <https://doi.org/10.1016/j.ijpe.2011.05.011>

Helo, P., & Hao, Y. (2022). Artificial intelligence in operations management and supply chain management: an exploratory case study. *Production Planning and Control*, 33(16), 1573–1590. <https://doi.org/10.1080/09537287.2021.1882690>

Hendry, L., Huang, Y., & Stevenson, M. (2013). Workload control: Successful implementation taking a contingency-based view of production planning and control. *International Journal of Operations and Production Management*, 33(1), 69–103. <https://doi.org/10.1108/01443571311288057>

Henttu-Aho, T. (2016). Enabling characteristics of new budgeting practice and the role of controller. *Qualitative Research in Accounting and Management*, 13(1), 31–56. <https://doi.org/10.1108/QRAM-09-2014-0058>

High-tech manufacturing struggles to fill jobs as number of openings grows. (2025, May). *The Edge Malaysia*. Retrieved September 21, 2025, from <https://theedgemaalaysia.com/node/755357>

Hussein Zolait, A., Razak Ibrahim, A., Sundram, V. P. K., & Chandran, V. G. R. (2010). Supply chain integration: An empirical study on manufacturing industry in Malaysia. *Journal of Systems and Information Technology*, 12(3), 210–221. <https://doi.org/10.1108/13287261011070830>

Hyer, N. L. (1982). Education: MRP/GT: A Framework for Production Planning And Control of Cellular Manufacturing. *Decision Sciences*, 13(4), 681–701. <https://doi.org/10.1111/j.1540-5915.1982.tb01899.x>

Inoue, M., Lindow, K., Stark, R., Tanaka, K., Nahm, Y. E., & Ishikawa, H. (2012). Decision-making support for sustainable product creation. *Advanced Engineering Informatics*, 26(4), 782–792. <https://doi.org/10.1016/j.aei.2012.07.002>

Iskandar, I. M., & Seraj, Z. (2025, July 31). 13MP: More than 1.2 million job opportunities in manufacturing, digital sectors over next 5 years [WATCH]. *NST Online*. Retrieved September 21, 2025, from

<https://www.nst.com.my/news/nation/2025/07/1253288/13mp-more-12-million-job-opportunities-manufacturing-digital-sectors>

- Jayal, A. D., Badurdeen, F., Dillon, O. W., & Jawahir, I. S. (2010). Sustainable manufacturing: Modeling and optimization challenges at the product, process and system levels. *CIRP Journal of Manufacturing Science and Technology*, 2(3), 144–152. <https://doi.org/10.1016/j.cirpj.2010.03.006>
- Joung, C. B., Carrell, J., Sarkar, P., & Feng, S. C. (2013). Categorization of indicators for sustainable manufacturing. *Ecological Indicators*, 24, 148–157. <https://doi.org/10.1016/j.ecolind.2012.05.030>
- Kang, S. L. (2019, March 22). Why does Malaysia Airlines keep failing-and is there a way to stop it? *The Edge Malaysia*
- Kakouris, A. P., & Polychronopoulos, G. (2005). Enterprise Resource Planning (ERP) System: An Effective Tool for Production Management. *Management Research News*, 28(6), 66–78. <https://doi.org/10.1108/01409170510784878>
- Kembro, J., & Norrman, A. (2022). The transformation from manual to smart warehousing: an exploratory study with Swedish retailers. *International Journal of Logistics Management*, 33(5), 107–135. <https://doi.org/10.1108/IJLM-11-2021-0525>
- Khanh, H. D., & Kim, S. Y. (2016). A survey on production planning system in construction projects based on Last Planner System. *KSCE Journal of Civil Engineering*, 20(1), 1–11. <https://doi.org/10.1007/s12205-015-1412-y>
- Kiran, D. R. (2019). *Production Planning and Control: A Comprehensive Approach*.
- Klöber-Koch, J., Braunreuther, S., & Reinhart, G. (2017). Predictive Production Planning Considering the Operative Risk in a Manufacturing System. *Procedia CIRP*, 63, 360–365. <https://doi.org/10.1016/j.procir.2017.03.118>
- Kwatra, S., Pandey, S., & Sharma, S. (2014). Understanding public knowledge and awareness on e-waste in an urban setting in India: A case study for Delhi. *Management of Environmental Quality: An International Journal*, 25(6), 752–765. <https://doi.org/10.1108/MEQ-12-2013-0139>
- Lage, M., & Godinho Filho, M. (2016). Production planning and control for remanufacturing: Exploring characteristics and difficulties with case studies. *Production Planning and Control*, 27(3), 212–225. <https://doi.org/10.1080/09537287.2015.1091954>
- Lane, R., & Szwejczewski, M. (2000). The relative importance of planning and control systems in achieving good delivery performance. *Production*

Planning and Control, 11(5), 422–433.
<https://doi.org/10.1080/09537280050051924>

- Leis, O., Meichsner, N., & Swettenham, L. D. (2025). Team Performance Management: An International Journal Exploring esports players' perspectives on sport psychology support: an interview study. *Tunku Abdul Rahman User On*, 14. <https://doi.org/10.1108/TPM-07-2024-0080>
- Linke, B. S., Corman, G. J., Dornfeld, D. A., & Tönissen, S. (2013). Sustainability indicators for discrete manufacturing processes applied to grinding technology. *Journal of Manufacturing Systems*, 32(4), 556–563. <https://doi.org/10.1016/j.jmsy.2013.05.005>
- López-Paredes Valladolid, A. (2014). *Industrial Management - Control and Profit*. Springer Cham Heidelberg New York Dordrecht London. <http://www.springer.com/series/>
- Mahendrawathi, E. R., Arsad, N., Astuti, H. M., Kusumawardani, R. P., & Utami, R. A. (2018). Analysis of production planning in a global manufacturing company with process mining. *Journal of Enterprise Information Management*, 31(2), 317–337. <https://doi.org/10.1108/JEIM-01-2017-0003>
- Malek, J., & Desai, T. N. (2020). A systematic literature review to map literature focus of sustainable manufacturing. In *Journal of Cleaner Production* (Vol. 256). Elsevier Ltd. <https://doi.org/10.1016/j.jclepro.2020.120345>
- McGhee, G., Marland, G. R., & Atkinson, J. M. (2007). Grounded theory research: literature reviewing and reflexivity. In *Journal of Advanced Nursing* (Vol. 60, Issue 3). <http://eprints.gla.ac.uk/4185/http://eprints.gla.ac.uk>
- MIDA. (2024a, July 3). *Services, manufacturing made up 82.6 per cent of economy in 2023*, <https://www.mida.gov.my/mida-news/services-manufacturing-made-up-82-6-per-cent-of-economy-in-2023/>
- MIDA. (2024b, December 5). *Value added GDP of manufacturing sector increases 5.5% to RM97.4 bil in third quarter of 2024*, <https://www.mida.gov.my/media-release/sandvik-celebrates-inauguration-of-new-load-and-haul-factory-in-malaysia/>
- Morgan, D. L. (2023). Exploring the Use of Artificial Intelligence for Qualitative Data Analysis: The Case of ChatGPT. *International Journal of Qualitative Methods*, 22. <https://doi.org/10.1177/16094069231211248>
- Mumford, M. D., Higgs, C., & Gujar, Y. (2021). Ethics in coercive environments: Ensuring voluntary participation in research. In S. Panicker & B. Stanley (Eds.), *Handbook of research ethics in psychological science* (pp. 113–123). American Psychological Association. <https://doi.org/10.1037/0000258-008>

- Mustafa, M., Nasir, M., Hj, B., Asniza, S., & Yusuf, B. (2025). Performance Management Policies and Procedures and National Culture: A Case Study of an Electricity Generation Company In Malaysia. *Issue 5. Ser, 27*, 79–84. <https://doi.org/10.9790/487X-2705037984>
- Naeem, M., Ozuem, W., Howell, K., & Ranfagni, S. (2023). A Step-by-Step Process of Thematic Analysis to Develop a Conceptual Model in Qualitative Research. *International Journal of Qualitative Methods*, 22. <https://doi.org/10.1177/16094069231205789>
- Ngu, H. J., Lee, M. D., & Bin Osman, M. S. (2020). Review on current challenges and future opportunities in Malaysia sustainable manufacturing: Remanufacturing industries. In *Journal of Cleaner Production* (Vol. 273). Elsevier Ltd. <https://doi.org/10.1016/j.jclepro.2020.123071>
- Nguyen-Trung, K., Saeri, A. K., & Kaufman, S. (2024). Applying ChatGPT and AI-Powered Tools to Accelerate Evidence Reviews. *Human Behavior and Emerging Technologies*, 2024. <https://doi.org/10.1155/2024/8815424>
- Nii Laryeafio, M., & Ogbewe, O. C. (2023). Ethical consideration dilemma: systematic review of ethics in qualitative data collection through interviews. *Journal of Ethics in Entrepreneurship and Technology*, 3(2), 94–110. <https://doi.org/10.1108/jjeet-09-2022-0014>
- O’Grady, P. J. (1986). *Controlling Automated Manufacturing Systems*. Springer Science & Business Media. <https://doi.org/10.1007/978-94-011-7468-8>
- O’Reilly, S., Kumar, A., & Adam, F. (2015). The role of hierarchical production planning in food manufacturing SMEs. *International Journal of Operations and Production Management*, 35(10), 1362–1385. <https://doi.org/10.1108/IJOPM-04-2014-0157>
- Oliveira Neto, G. C. de, Pinto, L. F. R., Amorim, M. P. C., Giannetti, B. F., & Almeida, C. M. V. B. de. (2018). A framework of actions for strong sustainability. *Journal of Cleaner Production*, 196, 1629–1643. <https://doi.org/10.1016/j.jclepro.2018.06.067>
- Oluyisola, O. E., Bhalla, S., Sgarbossa, F., & Strandhagen, J. O. (2022). Designing and developing smart production planning and control systems in the industry 4.0 era: a methodology and case study. *Journal of Intelligent Manufacturing*, 33(1). <https://doi.org/10.1007/s10845-021-01808-w>
- Othman, M., Bhuiyan, N., & Gouw, G. J. (2012). Integrating workers’ differences into workforce planning. *Computers and Industrial Engineering*, 63(4), 1096–1106. <https://doi.org/10.1016/j.cie.2012.06.015>

- Otley, D. (2016). The contingency theory of management accounting and control: 1980-2014. *Management Accounting Research*, 31, 45–62. <https://doi.org/10.1016/j.mar.2016.02.001>
- Oyewo, B., Alta'any, M., Alo, K. A., & Dube, N. T. (2024). Determinants and impact of production planning and control accounting techniques on competitiveness of manufacturing companies: a structural equation modelling approach. *Accounting Research Journal*, 37(4), 453–478. <https://doi.org/10.1108/ARJ-01-2023-0014>
- Oyewo, B., Tawiah, V., & Zakari, A. (2022). ACTUALISING AGENDA 2030 THROUGH SUSTAINABILITY ACCOUNTING: EVIDENCE FROM THE NIGERIAN MANUFACTURING SECTOR. *Advances in Environmental Accounting and Management*, 10, 105–133. <https://doi.org/10.1108/S1479-359820220000010006>
- Pablo Usuga Cadavid, J., Lamouri, S., Grabot, B., Pellerin, R., Fortin, A., & Fortin Ma-, A. (2020). Machine learning applied in production planning and control: a state-of-the-art in the era of industry 4.0 chine learning applied in production planning and control: a state-of-the-art in the era of industry 4.0. *Journal of Intelligent Manufacturing*, 2020(6), 31. <https://doi.org/10.1007/s10845-019-01531-7i>
- Park, P. S. (1991). The examination of worker cross-training in a dual resource constrained job shop. In *European Journal of Operational Research* (Vol. 51).
- Patton, M. Q. (2002). *Qualitative Research & Evaluation Methods* (3rd ed.). Sage.
- Petrova, E., Dewing, J., & Camilleri, M. (2016). Confidentiality in participatory research: Challenges from one study. *Nursing Ethics*, 23(4), 442–454. <https://doi.org/10.1177/0969733014564909>
- Qiao, S., Fang, X., Wang, J., Zhang, R., Li, X., & Kang, Y. (2025). Generative AI for thematic analysis in a maternal health study: coding semistructured interviews using large language models. *Applied Psychology: Health and Well-Being*, 17(3). <https://doi.org/10.1111/aphw.70038>
- Rahmani, M., Romsdal, A., Sgarbossa, F., Strandhagen, J. O., & Holm, M. (2022). Towards smart production planning and control; a conceptual framework linking planning environment characteristics with the need for smart production planning and control. *Annual Reviews in Control*, 53, 370–381. <https://doi.org/10.1016/j.arcontrol.2022.03.008>
- Rashid, Y., Rashid, A., Warraich, M. A., Sabir, S. S., & Waseem, A. (2019). Case Study Method: A Step-by-Step Guide for Business Researchers.

- Saad, S. M., Bahadori, R., Jafarnejad, H., & Putra, M. F. (2021). Smart Production Planning and Control: Technology Readiness Assessment. *Procedia Computer Science*, 180, 618–627. <https://doi.org/10.1016/j.procs.2021.01.284>
- Sagawa, J. K., & Nagano, M. S. (2021). Integration, uncertainty and information: how do they affect planning performance? *Revista de Gestao*, 28(1), 23–49. <https://doi.org/10.1108/REG-11-2019-0113>
- Saidi-Mehrabad, M., Paydar, M. M., & Aalaei, A. (2013). Production planning and worker training in dynamic manufacturing systems. *Journal of Manufacturing Systems*, 32(2), 308–314. <https://doi.org/10.1016/j.jmsy.2012.12.007>
- Salim, S. (2025, January 10). Malaysia's industrial output grew faster than expected at 3.6% in November. *The Edge Malaysia*. Retrieved from September 21, 2025, from <https://theedgemalaysia.com/node/740544>
- Samaranayake, P., & Toncich, D. (2007). Integration of production planning, project management and logistics systems for supply chain management. *International Journal of Production Research*, 45(22), 5417–5447. <https://doi.org/10.1080/00207540600810077>
- Saunders, Mark. N. K., Lewis, P., & Thornhill, A. (2016). *Research Methods for Business Students*, Pearson Education, Harlow, Vol. Seventh.
- Schuh, G., Reuter, C., Prote, J. P., Brambring, F., & Ays, J. (2017). Increasing data integrity for improving decision making in production planning and control. *CIRP Annals - Manufacturing Technology*, 66(1), 425–428. <https://doi.org/10.1016/j.cirp.2017.04.003>
- Siedlecki, S. L. (2020). Understanding Descriptive Research Designs and Methods. *Clinical Nurse Specialist*, 34(1), 8–12. <https://doi.org/10.1097/NUR.0000000000000493>
- Siengthai, S., & Pila-Ngarm, P. (2016). The interaction effect of job redesign and job satisfaction on employee performance. *Evidence-Based HRM*, 4(2), 162–180. <https://doi.org/10.1108/EBHRM-01-2015-0001>
- Singla, H. K., & Phadtare, M. (2025). Risk management practices in construction projects: a qualitative exploration of MSMEs in India. *Journal of Advances in Management Research*. <https://doi.org/10.1108/JAMR-06-2024-0217>

- Smith, S. F. (1992). Knowledge-based production management approaches, results and prospects. *Production planning & control*, 3(4), 350-380. <https://doi.org/10.1080/09537289208919407>
- Smith, S. F. (1993). *Knowledge-based production management: approaches, results and prospects*.
- Sofiah, A. (2023, December 14). Updates on DOSM's AES 2022 Employment and Salaries & Wages Statistics. *Human Resources Online*. Retrieved September 21, 2025, from <https://www.humanresourcesonline.net/updates-on-dosm-s-aes-2022-employment-and-salaries-wages-statistics?>
- Soto, K. C. A., Rivera, H. H., de La Riva Rodríguez, J., & Martínez, R. M. R. (2016). Effects of human factors in planning and production control activities in remanufacturing companies. *Advances in Intelligent Systems and Computing*, 490, 465–474. https://doi.org/10.1007/978-3-319-41697-7_41
- Sriram, C. L., King, J. C., Mertus, J. A., Martin-Ortega, O., & Herman, J. (2009). *Surviving Field Research* (1 st). Taylor & Francis e-Library and NewYork.
- Stevenson, M. (2009). Editorial: Practical implementation of production planning and control concepts in SMEs and MTOs: An introduction to the special issue. In *Production Planning and Control* (Vol. 20, Issue 7, pp. 541–547). Taylor and Francis Ltd. <https://doi.org/10.1080/09537280903034222>
- Stevenson, M., Hendry, L. C., & Kingsman, B. G. (2005). A review of production planning and control: The applicability of key concepts to the make-to-order industry. *International Journal of Production Research*, 43(5), 869–898. <https://doi.org/10.1080/0020754042000298520>
- Sun, H., Kim, M. R., Kim, S., & Choi, L. (2025). A methodological exploration of generative artificial intelligence (AI) for efficient qualitative analysis on hotel guests' delightful experiences. *International Journal of Hospitality Management*, 124. <https://doi.org/10.1016/j.ijhm.2024.103974>
- Syreyshchikova, N. V., Pimenov, D. Y., Mikolajczyk, T., & Moldovan, L. (2020). Automation of production activities of an industrial enterprise based on the ERP system. *Procedia Manufacturing*, 46, 525–532. <https://doi.org/10.1016/j.promfg.2020.03.075>
- Tang, O., & Naim, M. M. (2004). The impact of information transparency on the dynamic behaviour of a hybrid manufacturing/remanufacturing system. *International Journal of Production Research*, 42(19), 4135–4152. <https://doi.org/10.1080/00207540410001716499>

- Taylor, S., & Land, C. (2014). Organizational anonymity and the negotiation of research access. *Qualitative Research in Organizations and Management: An International Journal*, 9(2), 98–109. <https://doi.org/10.1108/QROM-10-2012-1104>
- The Business Today (2025, April 8). Panasonic Malaysia Expected 3% Loss in Revenue from Gas Supply Disruption. *The Business Today*. Retrieved November 21, 2025, from <https://www.businesstoday.com.my/2025/04/08/panasonic-malaysia-expects-3-loss-in-revenue-from-gas-supply-disruption/>
- The Edge Malaysia. (2025, May 15). High-tech manufacturing struggles to fill jobs as number of openings grows. *The Edge Malaysia*.
- Thomas, O. O., & Lawal, O. R. (2020). Exploratory Research Design in Management Sciences: An X-Ray of Literature. *Annals of Dunarea de Jos University of Galati. Fascicle I. Economics and Applied Informatics*, 26(2), 79–84. <https://doi.org/10.35219/eai15840409109>
- Tilley, L., & Woodthorpe, K. (2011). Is it the end for anonymity as we know it? a critical examination of the ethical principle of anonymity in the context of 21st century demands on the qualitative researcher. *Qualitative Research*, 11(2), 197–212. <https://doi.org/10.1177/1468794110394073>
- Towill, D. R., Zhou, L., & Disney, S. M. (2007). Reducing the bullwhip effect: Looking through the appropriate lens. *International Journal of Production Economics*, 108(1–2), 444–453. <https://doi.org/10.1016/j.ijpe.2006.12.024>
- Towers, N., Knibbs, A., & Panagiotopoulos, N. (2005). Implementing manufacturing resource planning in a Greek aerospace company - A case study. *International Journal of Operations and Production Management*, 25(3), 277–289. <https://doi.org/10.1108/01443570510581871>
- Trost, M., Forstner, R., Claus, T., Herrmann, F., Frank, I., & Terbrack, H. (2019). Sustainable production planning and control: A systematic literature review. *Proceedings - European Council for Modelling and Simulation, ECMS*, 33(1), 303–309. <https://doi.org/10.7148/2019-0303>
- Vorderwinkler, M., & Heiß, H. (2011). Nachhaltige Produktionsregeln. *Berichte aus Energie-und Umweltforschung*, 40, 2011. <http://www.nachhaltigwirtschaften.at>
- Wang, X., Li, D., O'brien, C., & Li, Y. (2010). A production planning model to reduce risk and improve operations management. *International Journal of Production Economics*, 124(2), 463–474. <https://doi.org/10.1016/j.ijpe.2009.12.009>

- Wiendahl, H. H., & Westkämper, E. (2006). Systematic analysis of PPC system deficiencies—analytical approach and consequences for PPC design. *CIRP annals*, 55(1), 479-482.
- Wilson, F., Desmond, J., & Roberts, T. (1994). Success and Failure of MRP II Implementation. *British Journal of Management*, 5, 221–240.
- Xu, Z., Wang, Y., & Qian, Y. (2025). The design and application of in-depth interviews in primary care research. *Chinese General Practice Journal*, 2(2), 100062. <https://doi.org/10.1016/j.cgpj.2025.100062>
- Yin, R. K. (2009). *Case study research: Design and methods* (Vol. 5). sage.
- Yin, R. K. (2018). *Case study research and applications* (Vol. 6). Thousand Oaks, CA: Sage.
- Young, J. C., Rose, D. C., Mumby, H. S., Benitez-Capistros, F., Derrick, C. J., Finch, T., Garcia, C., Home, C., Marwaha, E., Morgans, C., Parkinson, S., Shah, J., Wilson, K. A., & Mukherjee, N. (2018). A methodological guide to using and reporting on interviews in conservation science research. *Methods in Ecology and Evolution*, 9(1), 10–19. <https://doi.org/10.1111/2041-210X.12828>
- Zarte, M., Pechmann, A., & Nunes, I. L. (2019). Indicator framework for sustainable production planning and controlling. *International Journal of Sustainable Engineering*, 12(3), 149–158. <https://doi.org/10.1080/19397038.2019.1566410>
- Zarte, M., Pechmann, A., & Nunes, I. L. (2022). Knowledge framework for production planning and controlling considering sustainability aspects in smart factories. *Journal of Cleaner Production*, 363. <https://doi.org/10.1016/j.jclepro.2022.132283>
- Zerfass, A., & Volk, S. C. (2018). How communication departments contribute to corporate success: The communications contributions framework. *Journal of Communication Management*, 22(4), 397–415. <https://doi.org/10.1108/JCOM-12-2017-0146>
- Zgpfel, G., & Missbauer, H. (1993). Production planning and control (PPC) systems including load-oriented order release-problems and research perspectives. In *International Journal of Production Economics*.
- Zipfel, A., Braunreuther, S., & Reinhart, G. (2019). Approach for a production planning and control system in value-adding networks. *Procedia CIRP*, 81, 1195–1200. <https://doi.org/10.1016/j.procir.2019.03.291>

Appendix

Appendix 1.1:Company Approval

Hello Yap Yong Yun,

Greeting to you!

Appreciate that you have reached out to us.

Hereby we confirm that, you shall proceed your request and make arrangement to conduct your final year project at our facility.

Please advise us the timelines / dates that you are planning to visit us.

During each visit (if any) - please confirm with your Host (in this case, Dennis Yap - the Order Desk & Production Planning Manager) and inform to HR/EHS in advance, at least 1 week earlier.

For initial, we will get you registered via VMS (Visitor Management System) to allow access into our facility.

You may have to sign a simple NDA (Non-Disclosure Agreement) upon arrival on first day.

PPEs are available at EHS Hub for you to utilize.

Appendix 3.2: Interview Questions

Interview Questions

Hi, thank you so much for taking the time to talk with me today. I really appreciate it. I'm conducting this interview as part of a study focused on understanding what really makes production planning work well here at Sandvik. My main goal is to explore your experiences and uncover what helps things run smoothly. This interview will take almost 40 minutes.

There are no right or wrong answers here; I just want to hear your honest thoughts and experiences. Everything you share will be kept completely confidential and used only for the purpose of this study. Also, if at any point you're not comfortable answering a question, that's totally okay – just let me know. Is it alright if we start now?

1. Could you walk me through your role and responsibilities here at Sandvik?
2. I believe your role plays an important part in the company's overall operations. Could you explain how your specific job contributes to the bigger picture of production planning and control?
3. From your perspective, could you give me a sense of how production planning and control is actually carried out here at Sandvik Seremban?
4. When it comes to production schedules, how do you personally ensure they align well with demand and the resources you have available?
5. Based on the current production planning processes, what practices or tools do you find are the most critical for things to run smoothly? Could you share some examples with me?
6. In your experiences, what current production/ company practice is really bringing the most significant impact on the overall effectiveness and efficiency of operations?
Transparency, communication, follow up
7. What do you believe are the absolute 'must-haves' in production planning and control for it to be truly effective here? May cause production planning control may fail
8. When is the production planning here really delivers truly exceptional results, what do you believe are the key circumstances or elements that are in place to make that happen? "When production planning works really well here, what are the main factors or conditions that make it successful?" on track until delivery according to schedule
9. Could you share any past experiences or lessons you have learned that you think have been particularly helpful in making production planning sustainable here in the long run?
10. To wrap things up, is there anything else you'd like to add about production planning, or anything else you feel is really important for understanding what helps things run well here that we haven't touched upon yet.

Thank you very much for taking the time to participate in my interview. I truly appreciate your valuable insights and willingness to share your experiences, which will greatly contribute to my research.

Appendix 3.3: Ethical Approval



UNIVERSITI TUNKU ABDUL RAHMAN DU012(A)
Wholly owned by UTAR Education Foundation Co. No. 578227-M

Re: U/SERC/78-612/2025

6 October 2025

Dr Fitriya Binti Abdul Rahim
Head, Department of International Business
Faculty of Accountancy and Management
Universiti Tunku Abdul Rahman
Jalan Sungai Long
Bandar Sungai Long
43000 Kajang, Selangor

Dear Dr Fitriya,

Ethical Approval For Research Project/Protocol

We refer to your application for ethical approval for your student's research project from Bachelor of International Business (Honours) programme enrolled in course UKMZ3016. We are pleased to inform you that the application has been approved under Expedited Review.

The details of the research projects are as follows:

No.	Research Title	Student's Name	Supervisor's Name	Approval Validity
1.	Key Success Factors in the Implementation of Production Planning: A Case Study of a Multinational Engineering Company in Malaysia	Yap Yong Yun	Ms Lim Yee Wai	6 October 2025 – 5 October 2026

The conduct of this research is subject to the following:

- (1) The participants' informed consent be obtained prior to the commencement of the research;
- (2) Confidentiality of participants' personal data must be maintained; and
- (3) Compliance with procedures set out in related policies of UTAR such as the UTAR Research Ethics and Code of Conduct, Code of Practice for Research Involving Humans and other related policies/guidelines.
- (4) Written consent be obtained from the institution(s)/company(ies) in which the physical or/and online survey will be carried out, prior to the commencement of the research.

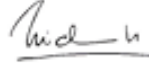
Kampar Campus : Jalan Universiti, Bandar Barat, 31900 Kampar, Perak Darul Ridzuan, Malaysia
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Website: www.utar.edu.my



Should the students collect personal data of participants in their studies, please have the participants sign the attached Personal Data Protection Statement for records.

Thank you.

Yours sincerely,



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