

Higher School of Business Studies

Of Algiers

EHEC

**Thesis Submitted in partial Fulfillment of the Requirements for
Master's Degree in Commercial**

Sciences

Major: Supply Chain Management

THEME:

**ESSAY ON THE ANALYSIS OF THE ROLE OF
MRP IN IMPROVING BUSINESS
PERFORMANCE**

CASE STUDY: HIKMA PHARMACEUTICALS

Presented by:

Miss.BEN ARIOUA Nour Elhouda
Miss.BOUROUH Safa

Supervised by:

Dr. BOUDIFA HAKIMA
Assistant Professor

"A" At EHEC

10th graduating class

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Dedication

First and foremost, to ALLAH, whose guidance and blessings have illuminated my path and granted me the strength to embark on this scholarly endeavor.

To my beloved parents, BEN ARIOUA MOKHTAR and ZAABI YAMINA, your unwavering love, encouragement, and sacrifices have been the driving force behind my achievements. Your belief in me has been a constant source of motivation and inspiration.

To my sisters, Manel, Imane, Rahef Yassmin, your support, love, and sisterly bond have brought immeasurable joy to my life. Your presence has been a source of comfort and encouragement throughout this journey.

To my brothers, Chouaib, Sid Ahmed, and Sid Ali, your guidance, strength, and camaraderie have been instrumental in shaping the person I am today. Your unwavering support has been a beacon of light in my darkest moments.

To my dear friends, Ichrak, Maysoune, and Nihel, your friendship, laughter, and unwavering support have made this journey unforgettable. Your presence has lifted my spirits and made even the most challenging times more bearable.

And lastly, to my dedicated and supportive study partner, Safa Bourouh, our collaboration and shared determination have propelled us forward. Your encouragement and unwavering commitment to our shared goals have been invaluable.

This dedication is a testament to the love, support, and guidance I have received from each of you. I am eternally grateful for your presence in my life and the role you have played in shaping my academic and personal growth. May our bonds continue to strengthen, and may our collective journey be filled with endless success and fulfillment.

Dedication

*All praise and thanks be to **Allah** for His virtues that have encompassed my life and his countless blessings that cannot be counted or enumerated. Praise be to You, O **Allah**,*

I dedicate this work with heartfelt gratitude to all those who have supported me, whether from near or far. To my dear parents, who hold the most cherished place in my heart, I offer a special gift filled with love and appreciation.

To my beloved mother, the beacon of my life, who has consistently encouraged and supported me throughout my academic journey, often prioritizing my needs above her own. She selflessly sacrificed to witness me reach this milestone.

To my father, the pillar of my existence, my unwavering support in life. He was the first to celebrate my accomplishments, even if it went unnoticed by others.

You will forever reign as king and queen in my heart.

To my dear brothers and sisters, the source of immeasurable joy in my life, your presence completes my journey. Your love, camaraderie, and unwavering support have enriched my path in countless ways. I am eternally grateful for the bond we share and the memories we have created together.

And to my precious nieces, Razan, Rihem, and Dina, you bring a unique and beautiful light to my life. May you always be blessed with love, happiness, and success. You hold a special place in my heart

And finally, I dedicate this work to my incredible best friends, maysoune, nihil and ichrak Your unwavering friendship has been a source of strength and inspiration in my life, and to my wonderful partner who has been with me since the beginning of this experience, Benarouia Nour Al-Houda, it was an honor for me to have you as my partner in this work. I wish you every success. We have unforgettable memories together. Thank you for being the truest and most incredible friends I could ever ask for.

Together, you all have shaped me into the person I am today, and I am honored to dedicate this work to each and every one of you.

Acknowledgements

First and foremost, we would like to express our gratitude to Allah for granting us the resources and perseverance to successfully complete this master's thesis.

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We would like to extend our sincere thanks to our supervisor, Dr. Boudifa Hakima, for her invaluable guidance, expertise, and insightful advice. Your support and direction have greatly contributed to the success of this work.

Our heartfelt appreciation goes to our internship supervisor, Taghlit Wassila, the Planning Manager at Hikma Pharma. Your mentorship and extensive knowledge in the field of planning have been of immense value to our academic growth.

We would also like to thank the planning team at Hikma Pharma, including Segmane Anis, Benzadi Imane, and Elamin, for their collaboration, support, and knowledge sharing. Your contributions have been instrumental in the completion of this thesis.

In conclusion, we would like to express our heartfelt gratitude to all those who have played a part in the completion of this master's thesis. Our appreciation extends to our families, friends, and all individuals who have provided assistance and support throughout this project.

Finally, we would like to extend our sincere thanks to all the members of the jury who kindly evaluated our work. Your time, expertise, and constructive feedback are greatly appreciated

Thank you all from the bottom of our hearts.

[HOUDA/SAFA]

Abstract

The pharmaceutical market is experiencing intense competition, compelling companies to enhance their commercial performance in order to maintain their position in the market.

This thesis focuses on analyzing the role of Material Requirements Planning (MRP) in improving business performance, using Hikma Pharmaceuticals as a case study.

The research findings reveal that while the implementation of MRP offers certain benefits, it alone is not adequate to drive significant improvements in business performance. Other critical factors, such as production capacity of machines, startling adjustments in delivery and production schedules, and efficient inventory management, are essential for effectively integrating with MRP to achieve enhanced performance.

By shedding light on the challenges associated with leveraging MRP, this study contributes to a deeper understanding of the subject and emphasizes the significance of considering various factors for comprehensive business improvement. These insights provide valuable guidance to pharmaceutical companies seeking to optimize their operations in a fiercely competitive market.

Keywords: Material Requirements Planning (MRP), commercial performance, the challenges, Operations optimization

Résumé

Le marché pharmaceutique connaît une intense concurrence, poussant les entreprises à améliorer leurs performances commerciales afin de maintenir leur position sur le marché.

Cette thèse se concentre sur l'analyse du rôle de logiciel de management des ressources de production (MRP) dans l'amélioration des performances commerciales, en utilisant Hikma Pharmaceuticals comme étude de cas.

Les résultats de la recherche révèlent que bien que la mise en œuvre de le MRP offre certains avantages, elle seule n'est pas suffisante pour entraîner des améliorations significatives des

performances commerciales. D'autres facteurs critiques, tels que la capacité de production des machines, les ajustements surprenants des calendriers de livraison et de production, ainsi que la gestion efficace des stocks, sont essentiels pour une intégration efficace avec le MRP afin d'obtenir des performances améliorées.

En éclairant les défis associés à l'utilisation de le MRP, cette étude contribue à une meilleure compréhension du sujet et souligne l'importance de prendre en compte divers facteurs pour une amélioration globale des activités commerciales. Ces informations fournissent des orientations précieuses aux entreprises pharmaceutiques cherchant à optimiser leurs opérations dans un marché fortement concurrentiel.

Mots clefs : de management des ressources de production (MRP), performances commerciales, les défis, optimiser les opérations

ملخص

يشهد سوق الأدوية منافسة شديدة، مما يدفع الشركات إلى تحسين أداءها التجاري للحفاظ على مكانتها في السوق. تركز هذه المذكرة على تحليل دور "برمجيات إدارة موارد الإنتاج" في تحسين الأداء التجاري للشركة من خلال دراسة حالة شركة الحكمة فارما

تشير نتائج البحث إلى أن تنفيذ هذا البرنامج يوفر فوائد عديدة، ولكنه وحده غير كافٍ لتحقيق تحسينات كبيرة في الأداء التجاري للشركة. بالإضافة إلى ذلك، هناك عوامل أخرى تلعب دورًا مهمًا، مثل قدرة الآلات الإنتاجية والتعديلات المفاجئة في جداول التسليم والإنتاج، إلى جانب إدارة المخزون بفعالية وغيرها، والتي تعد ضرورية لتحقيق تكامل فعال مع إدارة موارد الإنتاج وتحقيق أداء محسن

من خلال إلقاء الضوء على التحديات المتعلقة باستخدام "برمجيات إدارة موارد الإنتاج"، تساهم هذه الدراسة في فهم أفضل للموضوع وتؤكد على أهمية مراعاة العوامل المختلفة لتحقيق تحسين شامل في الأنشطة التجارية. وبالتالي، توفر هذه المعلومات إرشادات قيمة لشركات الأدوية التي تسعى إلى تحسين عملياتها في سوق تنافسي يواجه تحديات كبيرة

تحسين العمليات، الكلمات المفتاحية: برمجيات إدارة موارد الإنتاج، الأداء التجاري، التحديات

List of diagrams

N°	Title	Page
1	Evolution of market shares of the Top 5 laboratories in Algeria	93
2	The evolution of business achievements	96

List of figures

N°	Title	Page
1	Research approaches Business Performance	10
2	Ferrell and Hartline's (2014) model of business performance	12
3	Homburg et al's (2009) model of business performance	12
4	Slater and Narver's (1995) model of business performance	13
5	Approaches to assess a company's business performance.	14
6	The concept of effectiveness, efficiency, and performance.	17
7	Parameters of the commercial performance of the company.	25
8	Format of material requisition form	57
9	Mickel E. Porter Value Chain Model	59
10	The Core principals of Lean Method	62
11	Materials Resources Planning 1 et manufacturing resource planning 2	69
12	Schematic representation of the functional, organizational and hierarchical links of HIKMA PHARMA	87
13	Les étapes de la planification de la production	113
14	Nomenclature of UNISIA	127
15	Nomenclature of NOPAIN	128
16	Nomenclature of PROSPAN	129
17	Current VSM map of UNISIA and NOPAIN product production	147

List of tables

N°	Title	Page
1	Comparative Analysis of Internal and External Performance.	18
2	Representation of the 5 companies rank	94
3	The different evolution of realizations and objectives in 2021 and 2022	95
4	The different sections and objectives of the guide interview	98
5	Example of PIC	115
6	Example of PDP	118
7	Example of gross production requirements	120
8	Process Symbols	122
9	Material VSM symbols	123
10	Informational VSM symbols	124
11	General symbols	124
12	Pharmaceutical description of NOPAIN, PROSPAN, UNISIA	126
13	Nomenclature coding table of UNISIA	127
14	Nomenclature coding table of NOPAIN	128
15	Nomenclature coding table of PROSPAN	129
16	Production master plan of UNISIA, NOPAIN, PROSPAN	131
17	Table of gross production requirements for UNISIA	135
18	Table of gross production requirements for NOPAIN	135
19	Table of gross production requirements for PROSPAN	135
20	Table of Net Requirement Calculation for UNISIA	136

21	Table of Net Requirement Calculation for NOPAIN	139
22	Table of Net Requirement Calculation for PROSPAN	142
23	The different manufacturing steps for UNISIA and NOPAIN	149
24	Evolution of the product availability concurrently with the product satisfaction	152
25	Evolution of the on-delivery rate concurrently with the inventory turnover rate	155
26	Evolution of the revenue concurrently with the MRP utilization rate	157
27	Evolution of the sales growth rate concurrently with the stock turnover rate	161

List of abbreviations

Acronym	Expansion
AVS	The available for sale
BOM	Bill of Materials
CA	Chiffre d'affaires (sales revenue)
CBN	Calcul Besoins Nets
CIP	Continuous Improvement Program
DAV	Disponible à vendre (available for sale)
DAV	Research and development
DMAIC	Define-Measure-Analyze-Improve-Control
DP	The forecast available
ERP	Enterprise resources planning
FDA	Food and Drug Administration
HKUST	Hong Kong University of Science and Technology
HPA	Hikma Pharma Algeria
ICP	The Industrial and Commercial Plan
IEDA	Industrial Engineering and Decision Analytics
IT	Information Technology
JIT	Just-In-Time
KPI	Key performance indicator

LLC	Limited Liability Company
MENA	Middle East and North Africa
MPS	Manufacturing Planning and Scheduling
MS	Market Share
MRP	Material Requirement Planning
MRP II	Manufacturing Resource Planning
NMR	Net Material Requirements
NRC	Net Requirements Calculation
OA	Supply orders
OF	Manufacturing orders
P	Performance
PCH	Central Pharmacy of Hospitals
PIC	Plan Industriel Commercial (industrial commercial plan)
PDP	Production master plan
RFID	Radio-Frequency Identification
R&D	Research and development
ROI	Return on investment
ROE	Return on equity
SCM	Supply Chain Management
SLA	Service-Level Agreement
TOC	The Theory of Constraints

TRS	The rate of synthetic yield
UV	Unit Volume
VA	Value Added
VMI	Vendor-managed inventory
VSM	Value Stream Mapping
WMS	Warehouse Management System

Contents

General introduction	P 01
Chapter I: Overview of commercial Performance.....	P 06
Section 1: Literature Review on Business Performance	P 07
Section 2: Conceptual Analysis of Business Performance	P 15
Section 3: Main Elements and Characteristics of Business Performance	P 36
Section 4: Commercial Performance in the Pharmaceutical Industry.....	P 75
Chapter II: Order Processing Planning and Production Optimization.....	P 48
Section 1: Order Processing Planning for Raw Materials in Companies.....	P 49
Section 2: Optimization of production, a true key success factor	P 57
Section 3: Main Tools for Order Processing Planning and Production Optimization.....	P67
Section 4: Impact of Raw Materials Order Processing and Production Management on Business Performance.....	P 75
Chapter III: The Role of MRP in Improving Business Performance in Hikma Pharmaceutical Company.....	P 82
Section 1: Presentation of the company and the hosting structure (Hikma Pharmaceuticals)	P 83
Section 2: Presentation of the research methodology of the study.....	P 97
Section 3: Presentation of the study results.....	P 125
Section 4: Synthesis and analysis of the study results.....	P 163
General conclusion.....	P 169
Bibliography.....	P 190
Appendices.....	P 195

General introduction

Production is a critical element that significantly impacts the performance and success of businesses. It encompasses various processes and strategies aimed at optimizing resources, managing costs, and delivering high-quality products. The ability to efficiently produce goods is essential for meeting customer demands, maximizing profitability, and staying competitive in today's dynamic market.

Achieving optimal production performance can be challenging due to factors such as fluctuating demand, complex supply chains, evolving customer preferences, and technological advancements. To overcome these challenges, companies must develop robust production strategies and leverage innovative technologies to streamline their operations and drive continuous improvement.

One methodology that has gained considerable attention in enhancing production performance is Material Requirements Planning (MRP). MRP serves as a powerful tool for managing inventory, production schedules, and supply chain operations. By integrating suppliers, manufacturers, and distributors, MRP ensures the smooth flow of materials, timely delivery, and efficient order fulfilment. Its implementation helps companies achieve better coordination among supply chain partners, reduce lead times, and respond effectively to market demands.

In this research essay, titled "**Analysing the Role of MRP in Improving Business Performance**" we will delve into the various components of MRP and investigate its impact on commercial performance. Through a comprehensive analysis of MRP's role.

Analysing the role of Material Requirements Planning (MRP) in improving business performance is a topic of significant importance in today's competitive marketplace; it holds significant importance for several reasons:

- Effective use of MRP results in better cost control, analysing the role of MRP helps understand its impact on cost control and identifies strategies for further optimization.
- It identifies opportunities for process optimization, enhanced customer satisfaction, and cost savings.
- Analysing the role of MRP helps businesses understand its influence on customer satisfaction and identify ways to enhance it further.

We have chosen this topic for the reasons follow:

- To examine how enhancing the performance of Material Requirements Planning (MRP) influences overall business performance.
- To contribute to the academic exploration of supply chain management by investigating the topic of improving MRP performance. This research presents an opportunity to expand the existing knowledge base and provide valuable insights for both practitioners and researchers in this field.
- To explore the impact of new innovations on business performance within the context of MRP systems. Given the advancements in technology, there have been the emergences of novel tools, techniques, and approaches for optimizing MRP.

The aim of the study titled is to investigate the impact of Material Requirements Planning (MRP) on overall business performance and evaluate the effectiveness of MRP systems, identify critical success factors, analyse the relationship between MRP and business performance, explore the impact of MRP enhancements, and provide practical recommendations for optimizing MRP implementation.

The problem we are addressing in this study is to examine the role of Material Requirements Planning (MRP) in the enhancement of a company's commercial performance and the primary question we seek to answer is:

-How does MRP enable the optimization of upstream logistics operations and improve the commercial performance of Hikma Pharma Algeria?

This question is divided into three sub questions:

- ✓ What is the mode of operation of the MRP and what are the main factors studied in the context of the preparation of raw materials orders within Hikma Pharm Algeria?
- ✓ How the MRP allows to optimize the production management of the company Hikma Pharm Algeria?
- ✓ How do these processes impact on the improvement of the commercial performance of this same company?

To address the aforementioned question, we have formulated the following hypotheses:

- ✓ The MRP is software tool allowing to optimize the manufacturing process thanks to a system of production planning and automated inventory, it grants the possibility of studying several relevant factors within the framework of the orders of raw materials such as the deadlines of delivery, product life, stock coverage
- ✓ The use of MRP software in production processes enables the optimization of raw material and component management, as well as production lead times. This can lead to a reduction in production costs and improved production and procurement planning.
- ✓ The application of MRP software contributes to improving commercial performance by reducing the risk of stock outs, enhancing customer service, and increasing operational efficiency within the company. As a result, the product will be readily available, compliant, and high-performing, which reflects a strong brand image for a competitive business.

We would like to express our gratitude for the valuable contributions made by previous studies in this field, which have greatly enriched the existing research literature that forms the foundation of our study. Notable studies that have influenced our work include:

- ✓ Study by Dahmani Katia and Belkacem Melissa, " Design, production and integration of an ERP module for online management of the accreditation examination for medical visitors " a Master's thesis conducted at the Université Mouloud Mammeri during the academic year 2016/2017. The study focuses on the conception, realization, and integration of an ERP (Enterprise Resource Planning) module for managing the online accreditation examination for medical representatives or visitors. The purpose of the study is likely to develop a digital solution that streamlines and automates the process of accrediting medical visitors, ensuring efficient management of the examination and its related tasks.
- ✓ Study by Venkatraman and R. Vasudevan, "Measurement of Business Performance in Strategy Research: A Comparison of Approaches" by N. The Academy of Management Review 11, no. 4 (1986): 801–14, This article focuses on the measurement of business performance in the context of strategy research. It specifically compares different approaches to measuring business performance and evaluates their strengths and weaknesses.
- ✓ Study by V. Plauchu, "Mesure et amélioration des performances des entreprises", 2ème édition augmentée, édition Campus Ouvert, 2015, The book likely covers a range of topics related to performance measurement in the context of business organizations. It delves into different approaches, methodologies, and tools used to assess and monitor the performance of companies across various dimensions.

To address our primary research problem, subsidiary questions, and test our hypotheses, we have adopted a mixed-methods approach that combines qualitative and quantitative methodologies, which are suitable for the nature of our study. This approach allows us to comprehensively describe the commercial performance, analyse the planning of order processing and production optimization, and examine the influence of MRP on business performance.

To achieve this, we will employ an inductive method, complemented by semi-structured interviews and relevant research. As part of our theoretical study, we will focus on a specific pharmaceutical company, HIKMA PHARMA ALGERIA. By conducting these interviews and conducting further research, we aim to gain a comprehensive understanding of the impact of MRP utilization on the business.

The research work plan is structured into three core chapters, accompanied by a general introduction and general conclusion.

Chapter I offer a comprehensive exploration of general concepts and analysis pertaining to commercial performance, along with an examination of its distinctive characteristics.

Chapter II delves into the planning of order processing and production optimization, with a particular emphasis on exploring various tools used in these processes.

Chapter III analyses the significance of MRP in driving improvements in the commercial performance of Hikma Pharma Algeria.

In the overall conclusion, the results of the research are consolidated, highlighting the central importance of MRP in driving the enhancement of business performance of companies. It is concluded that the effectiveness of MRP hinges on factors such as experience and stability of the organizational environment. These additional elements play a vital role in deriving sustainable and impactful improvements in business performance.

Chapter I: Overview of Commercial Performance

Chapter I: Overview of Commercial Performance

Chapter Introduction

Commercial success is a crucial element for the sustainability of a business and the success of a company is closely linked to its commercial performance, which refers to its ability to achieve sales and meet its business goals effectively and efficiently. Therefore, evaluating the commercial performance of a company is essential to determine its financial health and competitiveness in the market.

In this introductory chapter, we will explore the various aspects of commercial performance. The first section will examine the evolution of research on it, on conceptual models, and methodological approaches to assess it.

In the second section, we will conduct a conceptual analysis of commercial performance by examining theoretical foundations, typologies, and indicators of performance, as well as the main axes of commercial performance and the tools for measuring and evaluating it.

In the third section, we will examine the main elements and characteristics of commercial performance, including control tools, measurement techniques, strategies and tactics, as well as the obstacles and challenges.

Then, the fourth section will focus on commercial performance in the pharmaceutical industry, highlighting the specificities, challenges, opportunities, and key success factors for commercial performance in this field.

Chapter I: Overview of Commercial Performance

Section 1: Literature Review on Commercial Performance

Commercial performance is a key concept in the business world, playing a crucial role in the success and growth of companies. Over the years, many researchers have studied commercial performance from different angles and perspectives, thus providing a rich literature on the subject. This section aims to explore this literature and present the various viewpoints and approaches that have been developed to assess and improve the commercial performance of companies.

A. *Evolution of Research on Commercial Performance*

The evolution of research on commercial performance invokes how theories and approaches to commercial performance have evolved over time. This evolution can be well observed through academic publications and research in the field.

It is important to study this evolution to understand the history and development of ideas and concepts related to commercial performance. This can also help identify current trends and advancement in the subject, as well as gaps or opportunities for future research.

A.1. *Early research on commercial performance*

One of the earliest research on commercial performance emerged in the 1950s and 1960s¹ when businesses began to focus more on the efficiency and effectiveness of their commercial activities. Researchers at this time sought to understand how businesses could maximize their profits and productivity while minimizing costs.

¹ The Economic History of Britain Since 1700, Volume 3 by Roderick Floud & Deirdre N. McCloskey

Early work on commercial performance focused on financial analysis and the use of financial ratios such as return on investment (ROI), return on equity (ROE), and debt-to-equity ratio to evaluate business performance. These financial ratios were widely used as they provide a clear and concise measure of company performance.

However, later research highlighted the limitations of financial analysis alone for evaluating commercial performance². Financial ratios do not take into account factors such as customer satisfaction, product or service quality, innovation, corporate social responsibility, and environmental sustainability.

Hence, research on commercial performance gradually expanded to include other aspects such as customer satisfaction, product and service quality, innovation, corporate social responsibility, and environmental sustainability, as well as more holistic approaches such as systemic analysis of commercial performance.

A.2. The explosion of research on business performance

In the 1980s, research on business performance³ experienced a true explosion, partly due to the growth of the service industry and the increasing interest in measuring customer satisfaction. Researchers began to further explore the relationship between business performance and customer satisfaction, focusing on marketing strategies, sales processes, and service policies⁴.

In the 1990s, research on business performance continued to develop with the introduction of new information and communication technologies, which opened up new opportunities to improve business performance. Researchers began to examine the impact of information and communication technologies on sales, profitability, productivity, as well as customer relationships.

² Non-financial performance measures in the Canadian biotechnology industry by Judy Cumby, Joan Conrod, *Journal of Intellectual Capital* ISSN: 1469-1930; 1 September 2001

³ Venkatraman, N., and Vasudevan Ramanujam. "Measurement of Business Performance in Strategy Research: A Comparison of Approaches." *The Academy of Management Review* 11, no. 4 (1986): 801–14.
<https://doi.org/10.2307/258398>

⁴ Dess, G. C., and Davis, P. S (1984). 'Porter's Generic strategies as determinants of strategic group membership and organizational performance'. *Academy of Management Journal*. 27 (September): 265-273.

In recent decades, research on business performance has continued with an emphasis on marketing strategies, customer relationship management, data analysis, and supply chain optimization. Recent research has also examined the impact of the COVID-19 pandemic on business performance and explored ways to adapt to changes in the business environment.

A.3. The Main Approaches to Research On Business Performance

There are several approaches to studying business performance, we mention the following:

Figure N°01: Research approaches Business Performance



Source: Created by the authors of the thesis

These approaches are not mutually exclusive and can be combined to provide an overview of a company's business performance.

A.4. Recent research on business performance

Recent research on business performance has focused on aspects such as customer relationship management, digitization of sales and marketing, real-time measurement of the business's performance through the use of data and advanced analytical tools, as well as the impact of that business performance on creating value for the company.

Studies have also examined how business performance can be improved through innovation management, inter-organizational collaboration, corporate social responsibility, and talent and employee skill management.

Recent research has also focused on commercial performance in specific contexts, such as the healthcare, finance, and e-commerce sectors⁵. Additionally, the impact of new technologies on commercial performance is also a rapidly expanding area of research. Technological advances have transformed consumer behavior and commercial practices, creating new challenges and opportunities for businesses.

Finally, emerging economies are also an important area of study for commercial performance. Companies looking to enter these markets must face unique challenges in terms of culture, regulation, and infrastructure, requiring an adaptation of their commercial strategies.

B. Conceptual models of business performance: a literature review

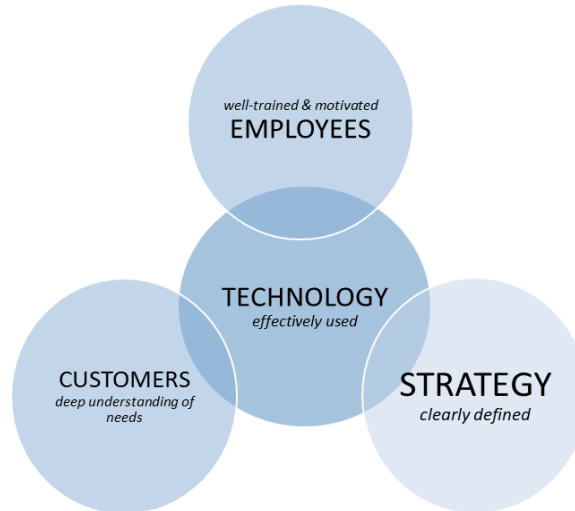
Studying conceptual models of business performance is an important section to understand the different theoretical frameworks that exist to analyze a company's business performance.

Conceptual models help understand the complexity of business performance by identifying the main factors that influence performance, as well as the relationships between these factors. Some of the most commonly used models include:

⁵ Barsauskas, P., sarapovas, T. and Cvilikas, A. (2008), "The evaluation of e-commerce impact on business efficiency", *Baltic Journal of Management*, Vol. 3 No. 1, pp. 71-91. <https://doi.org/10.1108/17465260810844275>

Ferrell and Hartline's (2014) model of business performance:

Figure N°02: Ferrell and Hartline's (2014) model of business performance



Source: Created by the authors

Although this model is useful for understanding the key factors that influence business performance, it does not explain how these factors interact to influence performance.

Homburg et al.'s (2009) model of business performance.

Figure N°03: Homburg et al.'s (2009) model of business performance



Source: Created by the authors

This model is useful for understanding the importance of customer satisfaction for business performance, but it does not take into account other key factors, such as organizational culture or business strategy.

Slater and Narver's (1995) model of business performance

Figure N°04: Slater and Narver's (1995) model of business performance



Source: Created by the authors

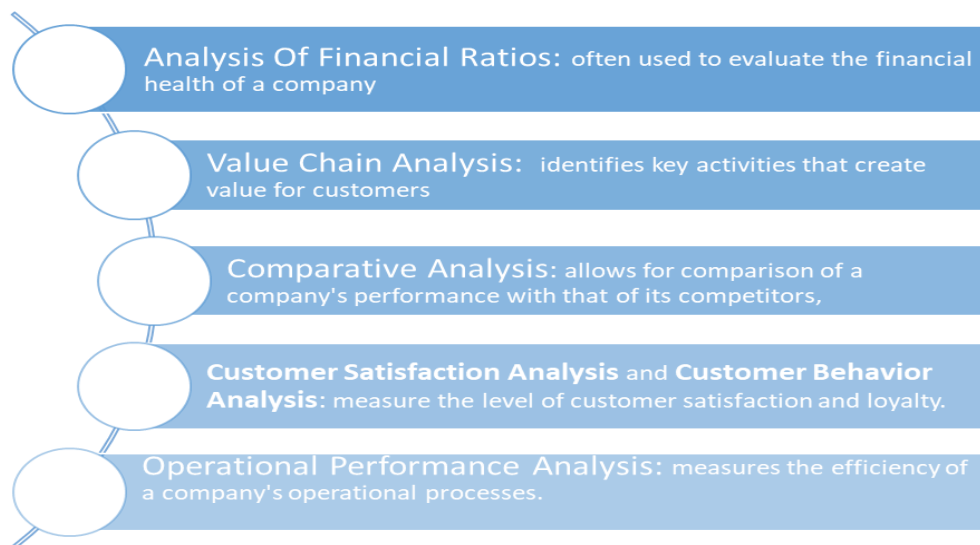
This model is useful for understanding the importance of customer orientation for business performance, but it does not take into account other key factors, such as organizational culture or business strategy.

C. Methodological Approaches to Assess Business Performance

There are many other conceptual models of business performance in the literature, but these are among the most commonly used. Each model offers a unique perspective on the factors that influence business performance, but it is important to recognize that these models are not exhaustive and cannot account for all factors that influence business performance.

The process of assessing business performance is crucial for any company looking to ensure its long-term success and growth. There are several methodological approaches to assess a company's business performance. Among the most common approaches:

Figure N°05: Approaches to assess a company's business performance.



Source: Created by the authors

It is important to note that these approaches can be used together to provide a more comprehensive evaluation of a company's business performance. By choosing the most appropriate evaluation method for its needs, a company can identify its strengths and weaknesses and take action to improve its business performance.

Section 2: Conceptual analysis of business performance

This part of the chapter analyzes the concepts related to business performance, reviewing existing definitions, theories, and models to understand how different components of business performance interact to affect business outcomes. This conceptual analysis is essential for a comprehensive understanding of the research subject as well as for developing appropriate research methods to examine business performance in the specific context of the studied enterprise.

A. The Theoretical Foundations of Business Performance

A.1. Definition of performance

According to AFNOR, "performance is a data that measures the efficiency and/or effectiveness of all or part of a process or system (real or simulated) in relation to a standard, plan, or objective, determined within the framework of a business strategy." ⁶

A.1.1 Efficiency

Represents the ability to carry out the expected action and achieve the desired result. An efficient action is one that precisely achieves its objectives. Efficiency can be applied to both individuals and processes. ⁷ "It is the degree of maximum achievement of the objectives set for the company." ^{8;9}

⁶ NAKHLA (Michel) : l'essentiel du management industriel, DUNOD, Paris, 2006, p. 44

⁷ PLAUCHU (Vincent) ; Mesure et amélioration des performances des entreprises, 2^{ème} édition augmentée, édition campus ouvert, 2015 , p.8

⁸ BENITO N ; M. COMBES et M.G FILLEAU : « Gestion de la relation commerciale », Dunod, Paris

⁹ Mr. AMRANI Rabah ,Mr. AMRANI Essaidh, La mesure de la performance commerciale d'une entreprise : Cas d'ELECTROINDUSTRIES :mémoire de master en Sciences de Gestion, à UNIVERSITE MOULOUD MAMMERI DE TIZI-OUZOU,2017- 2018,pp37

$$\text{Efficiency} = \frac{\text{Achieved Results}}{\text{Objectives}}$$

A.1.2 Effectiveness

Effectiveness is the ability to carry out the expected action with few resources or with the least possible resources. An effective action is one that is both efficient and cost-effective.

Effectiveness and efficiency are two dimensions of performance. One can be effective without being efficient, and it is also possible to increase efficiency without increasing effectiveness.^{10; 11}

$$\text{Effectiveness} = \frac{\text{Achieved results}}{\text{Resources used}}$$

The notion of effectiveness is related to the purpose. MOIGNE defines effectiveness as "the evaluation of the triptych (objectives-means-results) that is, going back to the purposes that are at the very origin of the system whose performance is being evaluated", effectiveness establishes the link between what the companies did and what it wanted to do.^{12, 13}

$$\text{Effectiveness} = \frac{\text{Satisfaction level achieved}}{\text{Results}}$$

The following concepts express efficiency:¹⁴

- **Productivity**

Ratio between production and a volume of consumed factors.

- **b) Profitability**

¹⁰ Idem

¹¹ Mr. AMRANI Rabah ,Mr. AMRANI Ibid pp 37

¹² HAMADMAD (Hakam), Op.cit. p.14

¹³ Mr. AMRANI Rabah ,Mr. AMRANI Ibid pp3

¹⁴ DORIATH (Brigitte) et GOUJET (Christian) : Gestion prévisionnelle et mesure de la performance, 5^{ème} édition, DUNOD, Paris, 2011, p.175

The ratio of a result to the associated revenue, for example: operating profit / revenue.

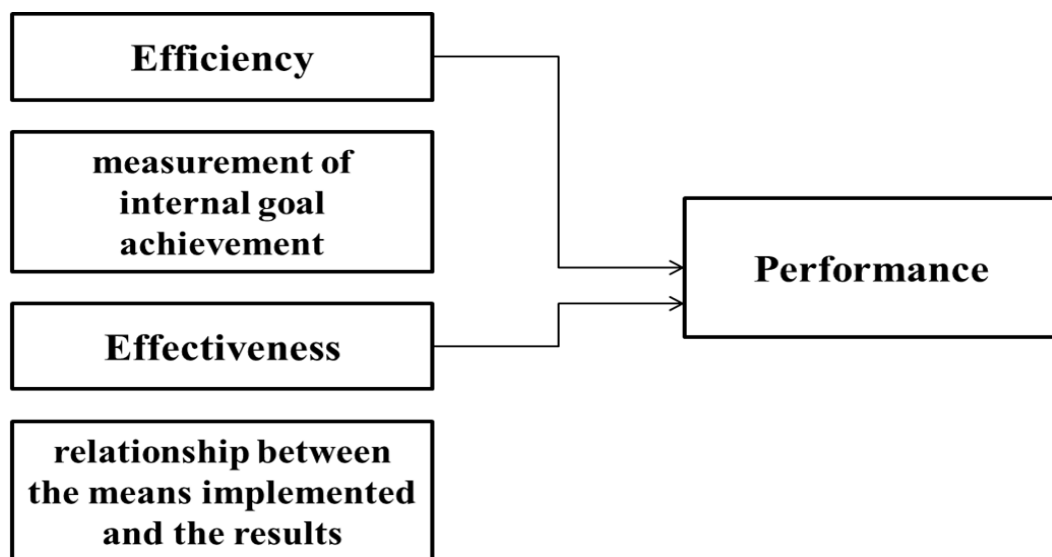
- **c) Return on investment (ROI)**

The ratio of a profit to the invested capital to obtain it, for example: distributable profit / equity capital.

A.1.3 Relevance

Relevance helps determine if the company has provided the necessary means to achieve its objectives.¹⁵

Figure N°06: The concept of effectiveness, efficiency, and performance.



Source : BESCOS P.L ET AL, « contrôle de gestion et management », Montchrestien, 4ème éd, paris, 1997, p42.

¹⁵ HAMADMAD (Hakam) ; définition d'une expression temporelle de la performance des entreprises manufacturières, Thèse de doctorat, Spécialité STIC traitement de l'information, GRONOBLE ALPES, 2017, p.15.

A.2. Typologies of Performance

Performance is studied with regards to the objectives of the organization and the expectations of the stakeholders, taking into account the context in which it occurs. It is important to identify the objectives, expectations, and contexts before analyzing performance, which can be categorized into the following:

A.2.1 Commercial performance

Which refers to putting all possible means in place to achieve the best commercial result, whether it is quantitative, such as "turnover or margin", which leads to an increase in the profitability of the company, or qualitative, such as through the dynamism and motivation of salespeople or the "investments, development of the company's image". Commercial performance can also be defined as the company's predisposition to meet the needs of its regular and potential customers by offering quality products and services that meet the needs and expectations of consumers.

A.2.2 Internal and External Performance

This is further distinguished as:

-Internal performance: This is mainly concerned with the internal actors of the organization. Financial information, which prioritizes communication on the profitability and major balances of the company, remains the preferred information in terms of performance, particularly for shareholders. However, managers of the organization, who are responsible for performance, are more interested in the process of achieving results.

-External performance: This generally addresses the actors in contractual relationships with the organization, and is mainly focused on action and financial organizations, and concerns present and future results.

The table below highlights the particularities of each performance (internal and external).

Table N°01: Comparative Analysis of Internal and External Performance.

External performance	Internal performance
Is mainly oriented towards shareholders and financial organizations	Is focused on managers
Focuses on present and future results	Relates to the process of building results from the organization's resources
Requires the production and communication of financial information	Requires providing necessary information for decision-making
Generates financial analysis of major balances	Leads to defining action variables
Leads to a debate among different stakeholders.	Requires a unique vision of performance to coordinate everyone's actions towards a common goal.

Source: Doriath, Brigitte, and Christian Goujet. Gestion prévisionnelle et mesure de la performance-5e éd.: Manuel. Dunod, 2011.

A.2.3 Organizational performance:

According to KALIKA.¹⁶ Organizational performance focuses on the organizational structure of the company and not on the social or economic structure. This means that measuring organizational performance reflects the organizational concerns that the company must address to avoid potential repercussions on overall performance.

¹⁶ M.KALIKA « structure d'entreprise : réalité, déterminants, performance. Paris, ECONOMICA, 1995, P.340

A.2.4 Operational performance:

Refers to the ability or capacity of a company or manager to achieve high commercial or financial objectives, considering the amount of resources and means used in a given period. It is defined based on the "objectives achieved - means used" couple.

A.2.5 Managerial performance:

Managerial capacity can be apprehended as the ability of a manager and operational managers to achieve the expected overall performance. Being a performing manager means being able to manage efficiently with rational anticipations.

A.2.6 Economic performance:

Concerns the results expressed by the accounting department and processed by the financial department. It mainly involves the different intermediate management balances and the ratios that result from them. These are the results directly linked to the activities of the company.

A.2.7 Strategic performance:

Can be defined as maintaining a distance from competitors, sustained by strong motivation (incentive and reward system) of all members of the organization and a focus on sustainable development. Long-term performance is therefore associated with the ability to challenge acquired advantages to avoid the failure of a good concept, the definition of a voluntary system aimed at the long term, and the company's ability to find sources of value that create margins.

A.2.8 Social performance:

Can be defined as "the level of satisfaction reached by individuals participating in the life of the organization".¹⁷ This success will be compared to all the means used to achieve it, defined as "the social effort of an organization". Social performance is determined within corporate social responsibility, aiming to assess the social behavior of employees and company leaders, and

¹⁷ Martory. B, « contrôle de gestion sociale », édition vuiber, paris, 1990, p.215

improve the well-being of employees, while striving for sustainable development. Improving this well-being involves resolving existing problems within the company such as absenteeism and sick leave.

A.3. Performance indicators

KPIs are management tools that allow for tracking, measuring, and evaluating the overall performance of a company or project in order to identify areas for improvement and make informed strategic decisions to achieve business objectives.

A.3.1 Different types of performance indicators¹⁸

To facilitate their use and better understand their purpose, it is customary to classify indicators into three categories based on the type of information transmitted and the expectations of the decision maker:

a) Alert indicators

This type of all-or-nothing indicator signals an abnormal state of the system under control that requires action, immediate or not. For example, crossing a critical threshold falls into this category of indicator.

b) Equilibration indicators

This type of performance indicator is closely linked to objectives and is somewhat the decision maker's compass. It informs about the state of the system under control in relation to the objectives followed.

c) Anticipation indicators

A good dashboard is also a prospective instrument with some anticipation indicators. A good dashboard allows for seeing a little further than the end of the screen and considering the current situation with a better footing.

¹⁸ <https://www.etudier.com/dissertations/Indicateurs-De-Performance/292107.html>

Another classification of indicator categories:¹⁹

- **Outcome indicators:** they indicate the result that can be achieved, for example: the quantity produced of a product manufactured by the company.

- **Process indicators:** they allow expressing the way of obtaining a result, for example: for an outcome indicator such as the quantity produced, we will have process indicators such as the number of incidents, the number of rejected parts, and the level of quality of the components used.

A.3.2 Performance factors

It is essential for a company to identify, analyze, and continuously adjust the factors that influence its performance. These factors are interdependent and must be balanced to ensure overall good performance. Any significant changes in one or more factors will have an impact on the others. Additionally, if a performance factor is weaker than the others, it will lead to an imbalance that will affect the company's performance. Performance factors include:

- The continuous improvement of the companies' products and service which are forced to meet the constantly evolving needs of the customers and their expectations , to retain them, and to involve them;
- The process: according to HAMMER (M), "The more complex the work, the more necessary the processes are";²⁰
- The achievability of the company's mission and objectives which need to be clearly defined, and communicated to all employees;
- The information about the external environment, which is crucial for a manager, as it allows for making the right decisions and anticipating market trends;
- The technology used in information, communication, and production, as it must be efficient, integrated, and user-friendly to ensure optimal efficiency ;

¹⁹ BRARACHE (Fahem) et HAMMI (Idris) ; Essai d'analyser de la performance logistique, Illustration selon le référentiel ASLOG : mémoire de master , option logistique et distribution, université de BEJAIA , 2019 , p .31

²⁰ <https://sites.google.com/site/barometredegestionstrategique/Accueil/articles/facteurs-de-performance>.

- The products must be effective and efficient;
- The Human resources: according to PETER (D), "The scarcest resource in any organization is talented people."²¹ That is why a company must recruit competent, responsible people and motivate them;
- The management style: "Without organization, there is no management. Without management, there is no organization," PETER (D);²²
- It is important that the performance indicators used by the company relate to quality, time, and cost, and that they are balanced and aligned with the company's overall objectives.

A.4. The main axes of commercial performance

A.4.1 The commercial function

The commercial function is the interface between the company and its customers. Therefore, the performance of salespeople plays an essential role in improving commercial performance, regardless of the cultural specificities of the company. The commercial department is responsible for three main missions, namely increasing sales and margins, developing commercial productivity, and improving team skills.

“The commercial function encompasses all activities directly or indirectly related to the function of its goods or services. It includes, in the act of sale itself, distribution, market analysis activities, consumer behavior studies, sales forecasting, communication and promotion, with a reaffirmation of customer sovereignty and the development of marketing tools. The commercial function tends to now have a role in integrating all operational functions of the company.”²³

A.4.2 Definition of commercial performance

In the field of commercial action, and based on BARNARD's contributions to organizational theory, the commercial performance of a company can be defined as the achievement of commercial objectives relative to the means deployed to achieve them. Put differently, the

²¹ Idem

²² Idem

²³ P.CHARPENTIER, « organisation et gestion de l'entreprise », édition Nathan, paris, 1997, p.230.

attainment of a certain level of achievement cannot be dissociated from the context and resources mobilized to achieve it.²⁴

A.4.3 Commercial performance can be translated as the achievement of commercial objectives relative to the means deployed to achieve them. It is defined by OUATTARA (2007)²⁵ as the ability of a company to satisfy its customers by offering them goods and services of good quality that are able to meet their expectations. PLAUCHU and TAÏROU (2008)²⁶ define it as: "The art of being present with the right interlocutor at the right time, with a relevant offer that allows for the establishment of lasting and profitable business relationships for the company in a context of constant search for excellence in the service provided."

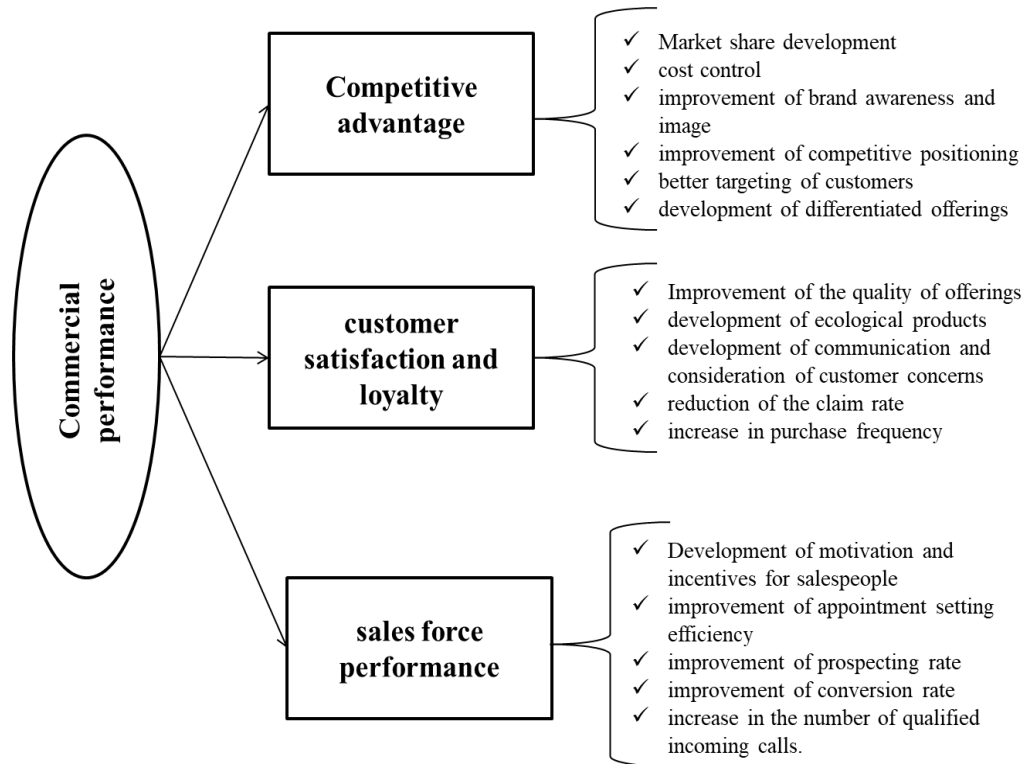
Most research on this concept focuses on the steps that can be taken to improve a company's commercial performance. This performance is evaluated based on the actual functioning of the company and by identifying key indicators as well as obstacles that may hinder its success. The objective of commercial performance is therefore to achieve the goals set by the company, particularly by satisfying and retaining customers. To achieve this, it is necessary to determine the levers that can be used to increase the company's commercial performance.

²⁴ <http://www.creg.ac-versailles.fr/spip.php?article217>.

²⁵ Ouattara P. (2007), « Diagnostic financier et performance d'une entreprise en Côte d'Ivoire ». MBA Finance D'entreprise, Ecole Supérieure de Gestion de Paris : Blog AXLANE : accélérateur de croissance.

²⁶ PLAUCHU V et TAÏROU A. Méthodologie du diagnostic d'entreprise. Le Harmattan, (2008), p.133.

Figure N°07: Parameters of the commercial performance of the company.



Source : Hmioui et al. (2017, p. 196).

A.4.3.1 Goal setting

Goal setting is essential for evaluating employee behavior within an organization, as well as mobilizing and motivating them. High-performing companies are those that have a clear, precise, and shared policy for evaluating and setting goals. An objective is an operational goal set by the company and its employees. It is a dynamic anticipation of the future, enabling action to be taken, distinct from the result. There are different types of objectives, quantitative (measurable) and qualitative (non-quantifiable). Quantitative objectives focus on sales figures, profitability, or productivity, while qualitative objectives aim to improve the quality of production or work organization. Objectives must be limited, precise, measurable, consistent, achievable, motivating, prioritized, and in line with the company's (human and material) resources.

Quantitative objectives are essential for monitoring the company, but qualitative objectives should be considered as means to achieve quantitative objectives.

A.4.4 Determinants of commercial performance

Here we discuss the factors that influence commercial performance in general, as well as the indicators used to evaluate it. Several elements can contribute to this performance, but the factors having a direct impact are:

- **Service quality:** the quality of a product or service is a crucial element of its attractiveness. It includes all the characteristics that allow satisfying customers expressed or implicit needs. Service quality is closely linked to customer satisfaction, so it is important that leaders pay special attention to it.
- **Financial capacity of resellers:** this is the set of financial resources that resellers have to ensure the smooth running of their activities. This capacity has an influence on almost all commercial performance indicators.
- **Production capacity:** it is the quantity of product offered by the company to meet demand during a given period. A significant increase in stocks without an increase in current consumption or a chronic decrease in stocks reflecting an excess of consumption over current production, can handicap the commercial performance of a distribution network.
- **Diversity of offer:** diversifying the offer allows satisfying the needs of different market segments of the company. The multiplicity of product or service ranges available has a direct impact on customer satisfaction and therefore on sales volume.
- **Extent of the distribution network:** product availability is a key element of customer satisfaction and has an undeniable influence on commercial performance. The more extensive the network, the more chances the company has of reaching a maximum number of consumers who can judge the product quality based on their needs and expectations. The number of resellers also has a direct impact on the overall sales of the network.

A.4.5 The levers of commercial performance

There are several levers to improve the commercial performance of a company, which are as follows:²⁷

A.4.5.1 Knowing and understanding the market

The purchasing practices in the industry, the competitive environment, the strategic functions of the company, etc. It is about knowing and understanding the factors that influence the company's results, and above all, knowing how to exploit this knowledge to produce more value in the future.

This step is vital for the company because it allows specifying the assumptions on which the established strategy will be based and a strategy is only as good or bad as the assumptions on which it is based.

A.4.5.2 Differentiating from the competition

Applying a differentiation strategy to attract and retain more customers.

It will allow the company to be more attractive in the future and therefore increase its business. It also helps identify the differences that make the company's specialty, and the internal strengths to maintain and weaknesses to combat to make the company more popular.

A.4.5.3 Evaluating commercial activity

Measurement is the essential fuel for the proper functioning of any commercial system. There can be no objectives without means of measurement, nor performance without evaluation. The company must be able to measure the effectiveness of commercial activity and monitor all key aspects of its commercial performance but also evaluate customer assets and measure the performance of commercial action.

The company must have a simple, reliable, relevant, and above all, quickly providing the requested data measurement system.

²⁷ http://leaconsulting.com/L&A/index.php?option=com_content&task=view&id=27&Itemid=46.

A.4.5.4 Identifying growth opportunities

Segmentation and analysis of the company's customer base are important sources of information that must be examined in conjunction with market data. They allow identifying the company's growth opportunities while setting priority development axes and acting on the levers that promote customer loyalty.

A.4.5.5 Directing commercial action

The Company's commercial policy is intimately linked to strategic thinking. It is the operational translation of the company's strategy, it is important to set the company's commercial objectives and identify targets to approach or develop. By quantifying and quantifying things, the company clarifies its ambition, makes its choices, gives the sense of action and focuses energies on priorities.

A.4.5.6 Setting individual contribution

the management system is everything that contributes to defining, motivating, monitoring, and evaluating the individual work of salespeople. It is the engine of commercial activity. To be commercially successful, it is not enough to set goals and provide direction for action. It is also necessary to create energy and movement to make things happen, and that is the purpose of the sales force management system.

A.4.5.7 Strengthening the influence of salespeople

the influence of a salesperson depends on their competence, their knowledge, their motivation and their power. The key competencies of a salesperson differ depending on the type of sales, the type of products sold, the level of the people they meet, the work environment, etc. It is important for the company to identify and develop the key competencies of its salespeople to increase their power of influence in the market.

A.4.5.8 Managing the sales force

Management habit is measured by the ability of the manager to use all sources of power at their disposal to manage their team. They must learn to articulate and elicit them to increase their power of influence over their team and focus energies on the company's priorities. Their focus

should be on identifying motivational drivers and improving interpersonal communication to mobilize teams to work.

A.4.5.9 Building team dynamics

A team dynamic strengthens the motivation, energy, intelligence, and competence of each team member. Developing the sales team and making lasting changes in the behavior of salespeople is one of the most important team dynamics, it is created through a series of steps, and the manager must lead this development to bring the team to maturity.

A.4.6 The indicators of commercial performance:

A.4.6.1 Definition of indicators of commercial performance²⁸

the indicators of commercial performance are measures that represent the progress and weaknesses of a company. It is therefore essential to choose the indicators that will allow us to correct the present situation and plan for the future. To properly evaluate the success of an organization, it is necessary to determine the measures that truly matter and prioritize them. Using inappropriate measures risks providing an incomplete or inappropriate representation of the company. Even worse, choosing the wrong performance indicators may give a sense of unjustified confidence in the company's chosen direction.

According to Anne Macque, these indicators must meet four conditions:

- Present certain elasticity or margin for improvement: those for which no improvement is necessary cannot contribute to financial results;
- Being under direct management control, which can make improvements as needed;
- Being correlated to financial results so that progress made is reflected in financial results;
- Finally, having moderate correlations with each one to prevent progress setbacks from one criterion at the expense of all others.

²⁸ Mr. AMRANI Rabah, Mr. AMRANI Essaidh mémoire Fin d'étude « La mesure de la performance commerciale d'une entreprise: Cas d'ELECTRO-INDUSTRIES », p :53

Indicators provide a basis for comparison to appreciate the quality of a result. This can be an objective or the results of competing companies.

A.4.6.2 Types of commercial performance indicators²⁹

there are two types of commercial performance indicators: quantitative indicators and qualitative indicators.

A.4.6.2.a Quantitative indicators

these indicators provide numerical data on the achievements of intermediaries.

We can distinguish between indicators related to sales, profitability indicators, and overall performance indicators.

i) Indicators related to sales

we can distinguish between two types: quantity-based indicators (sales volume) and value-based indicators (revenue).

- **Sales volume:** This is the quantity of products sold at a given price during a given period. In this case, commercial performance is evaluated by comparing forecasts with actual results. If the forecasts are higher than the actual results, the company has not met its objectives. Conversely, we can speak of an increase in sales and therefore good commercial performance if actual results exceed forecasts.

Performance (P) = Realization - Prevision

$P = 0$ or $P < 0$, implies poor performance.

$P > 0$ implies good performance.

- **Turnover:** Turnover is the amount earned by the company from third parties in the course of its normal and usual business activities.

More specifically, it is the amount of invoices issued during an accounting period, sent to

²⁹ Mr. AMRANI Rabah, Mr. AMRANI Essaidh mémoire Fin d'étude « La mesure de la performance commerciale d'une entreprise : Cas d'ELECTRO-INDUSTRIES », p :54 ,p57

customers and corresponding to work, supplies or services actually completed or in the process of being delivered at the close of the accounting period and subject to the condition of resulting from the normal business activity of the company. Turnover appears net of tax in the income statement under operating income.³⁰

This definition is characterized by its accounting aspect. A. BURLAND, J.Y. EGIEM, P. MYKITA propose a commercial definition. Turnover is the sum of sales of goods (commercial activity) and sold production (production of goods and services). It is the main activity indicator of the company. It conditions the overall performance.³¹

Indeed, turnover represents the commercial success of the company. Unlike quantities sold, the impact of prices is remarkable in the calculation of turnover. Therefore, its evolution is linked to two components:

quantities sold and prices charged by the company.

Performance (P) = Forecasted turnover - Actual turnover

With:

Turnover (CA) = Quantity sold × Unit price

this performance is always measured through the comparison between the projected revenue and the actual revenue.

- **The gross margin:** The gross margin is a key financial indicator for commercial companies that provide information on the level of profits achieved, its profitability, and its positioning in relation to the competition. Calculating the gross margin of products or

³⁰ RAIMBAULT.G., comptabilité analytique et gestion prévisionnelle, CHIHAB, 1994, p.171.

³¹ BURLAND A. EGLEM J.Y., dictionnaire de la gestion, FOUCHER, paris, 1995, P.84.

services helps to set a basis for their selling price and to choose an optimal pricing policy for the company.³²

To calculate it, the difference between the selling price of the products and the purchase price of the products sold is taken.

The formula for this calculation is as follows:

Gross Margin = Selling Price (excluding tax) - Cost of Goods Sold (excluding tax) + Change in Inventory

- **The market share:**

A market share represents the percentage of sales achieved by a company for a given product or service compared to all competitors.³³ J. LENDEVIE and D. LINDON define market share as the percentage represented by the sales of a product, brand, or company in the entire market. Market share is expressed in both volume and value.³⁴

MS = Number of units sold by the company / Total number of units sold in the market

MS: The market share

Unit: Product

- **The number of customers**

every customer base has a life cycle; it is born, lives, and dies. In order to compensate for lost customers (due to competition, bankruptcy, retirement, etc.), an enterprise must acquire new customers. To acquire new customers, the company must engage in

³² <https://www.l-expert-comptable.com/calculateurs/calculateur-taux-de-marge.html>.

³³ DEBOISLANDELLE H. ; Op.cit., p.313.

³⁴ LENDERVIE J. et LINDON D. ; Op.cit., p 217

prospecting. Salespeople must have the ambition to enrich the customer file with new customers in the interest of the company. They must diversify the customer base so that the revenue is less exposed to economic fluctuations or ruptures with certain customers. To do prospecting, one must have organizational skills, rigor, professionalism, and good communication skills.

ii) Profitability indicators

they include indicators of profit and return on invested capital:

- **Profit:** is the difference between total revenue and total expenses incurred in generating revenue during a given period.

$$\text{Profit (P)} = \text{Total revenue (income)} - \text{Total expenses}$$

$P = 0, P < 0$: poor performance.

$P > 0$: good performance.

- **Return on investment(ROI)**

To sell a good or service, a company must make certain investments in storage, transport, production, and others. The capital invested in these operations must be profitable, if not it must at least affect the performance.³⁵

A.4.6.2.b Qualitative Indicators

In addition to the quantitative indicators previously described, it is also important to have qualitative indicators that are frequently obtained through the use of statistical treatments (which are by nature quantitative), generally concerning the satisfaction and attitudes of customers towards the company or its products (the company's image).

i) Company image

³⁵ SAVALL H. ; ZARDET V, « maîtriser les coûts et les performances cachés », Ed, Economica, 1989, p.343

Image refers to a set of subjective and objective, affective and rational representations associated with the name of a company, profession, brand, or product that characterize it in the mind of a person or group of people³⁶. The image of a company is built from multiple sources: personalities and behavioral styles of executives, external staff (salespeople) because the salesperson is an ambassador of the company, occupying a privileged position in contact with customers, so the salesperson contributes to shaping the company's image. The company's image is evolutionary. It is influenced by the experience of salespeople, advertising, sales promotions, etc.

ii) Adaptation

this refers to the innovative capacity of intermediaries to cope with changes in the environment.

iii) Customer satisfaction

Satisfaction expresses "the pleasure that results from the fulfillment of what is expected, desired, or simply desirable."³⁷ Satisfaction is the conformity of customers' needs with the products offered to them. Thus, satisfaction would be a function of a difference. A demanding customer is a source of progress for the company, and measuring their satisfaction (that is evaluated by surveys) is an action to maintain a strong and lasting relationship.

For better customer satisfaction, the company must carry out a set of procedures:

- Implementation of a commercial quality plan, whose customer satisfaction surveys will be systematically exploited;
- Immediate handling of any complaint;
- Strengthening the pace of the relationship with the most important customers, through more frequent visits or phone calls or with a larger number of interlocutors;

³⁶ MOULINIER R. : Les techniques de ventes, les éditions d'organisation, 5e édition, 1998, p.158.

³⁷ DE BOISLANDELLE H. : gestion des ressources humaine dans la PME, economica , 2éme édition ,Paris, 1998, p .401

- Development, through information, of the treatment of information relating to each customer and their exploitation by the company;
- Follow-up by mail or phone of customers who have not ordered in X months;
- Retaliatory operations among the best customers of the most aggressive competitor(s).

A.4.6.2.c Key Performance Indicators based on rates³⁸

it is possible to create rates based on the results obtained through the previously mentioned quantitative and qualitative performance indicators. Indicators based on rates allow companies to manage their commercial strategy under good conditions.

- Conversion rate to leads or customers.
- Appointment setting rate.
- Customer retention rate.
- Customer loyalty rate.
- Attrition rate.
- Customer reactivation rate.
- Conquest rate.
- Efficiency rate.

To evaluate commercial performance, it is necessary to consider various indicators such as market share, customer retention, and acquisition of new customers, their satisfaction, as well as profitability by segment, customer, product or market. These indicators are grouped and presented in a dashboard to summarize the company's performance.

³⁸ <https://blog.hubspot.fr/sales/performance-commerciale>

A.4.7 Tools for measuring commercial performance

- The commercial dashboard

the commercial dashboard is a measurement tool that constitutes a lever for improving commercial performance. Indeed, it allows companies to measure commercial activity and to ensure follow-up according to the sales objectives set beforehand. A real steering tool, the commercial dashboard must be synthetic and built from coherent and relevant indicators. To present an effective dashboard, it is therefore important to choose the right KPIs. Analyzing the right indicators allows companies to have an overview of their performance, but also to make their sales teams progress.³⁹

The objectives of the commercial dashboard are multiple:⁴⁰

- evaluate the achievement of objectives,
- analyze the situation in real time to identify a diagnosis and an action plan,
- report objectives, variances, and performance,
- give a guideline to the sales team,
- receive alerts to react quickly,
- project into the future, make sales and hiring forecasts, etc.,
- adapt objectives and strategy,
- limit reporting and meetings,
- know customers better,
- Communicate and inform within the department, or even to the management.

- CRM software⁴¹

The contact files established by companies represent a wealth of information that is interesting to exploit. These files provide them with a better understanding of their target

³⁹ <https://blog.hubspot.fr/sales/performance-commerciale>

⁴⁰ <https://www.appvizer.fr/magazine/operations/gestion-commerciale/tableau-bord-commercial>

⁴¹ <https://blog.hubspot.fr/sales/performance-commerciale>

audience, allowing them to sell products and services adapted to the needs of prospects and to retain them. After generating leads, companies must therefore ensure the management and follow-up of these prospects. CRM software, or customer relationship management software, then appear as essential tools, as they provide companies with precise and relevant KPIs. It is from these indicators that companies will be able to monitor the customer journey and the evolution of sales.

Section 3: The Main Elements and Characteristics of Business Performance

A. Tools for monitoring business performance

Tools for monitoring business performance are key elements for monitoring, analyzing, and improving the performance of a company. Among the most commonly used tools are the Ishikawa diagram, the value chain, SWOT analysis, benchmarking, and the Balanced Scorecard.

-The Ishikawa diagram is a tool that allows for the analysis of the root causes of commercial performance problems. It helps visualize different factors such as processes, people, equipment, materials, etc. This analysis assists the company in understanding the underlying causes of performance problems and taking necessary measures to resolve them.

-The value chain is another tool that breaks down a company's activities into different stages, from procurement to delivery of the final product. By examining each stage of the value chain, the company can identify the activities that add value and those that do not, and make decisions to optimize performance.

-SWOT analysis is an internal and external analysis tool that helps determine a company's

strengths, weaknesses, opportunities, and threats. This analysis is useful for identifying areas to strengthen and opportunities to seize to improve performance.

-Benchmarking allows for the comparison of a company's performance to that of its competitors or the industry's best practices. This comparison identifies areas for improvement and practices to adopt to improve performance.

-The Balanced Scorecard is a strategic management tool that measures and tracks a company's performance through four perspectives: financial, customer, internal processes, and learning and growth. This balanced approach takes into account all dimensions of a company's performance and takes the necessary measures to improve them.

In summary, the tools for monitoring business performance are essential to monitor, analyze, and improve a company's performance. Each of these tools has its own advantages and limitations, so it is important to choose the appropriate tools based on the company's needs.

B. Techniques for measuring business performance⁴²

B.1. Conducting an audit of commercial performance

Before anything else, companies must take stock of their actual commercial performance. They must ensure the relevance of the decisions made based on their environment and the reality of the market. Therefore, they will conduct an audit to establish an action plan that includes identifying commercial objectives, performance indicators, and prospecting techniques to use such as social selling and inbound marketing. To conduct an audit, companies must rely on internal and external indicators and factors.

⁴² <https://blog.hubspot.fr/sales/performance-commerciale>

B.2. Measuring lead quality

To obtain information on its prospects, it is now more interesting to focus on the qualitative aspect than the quantitative one. The mission of the marketing department is therefore to ensure the improvement of the lead generation process. To evaluate the quality of leads generated, companies must pay attention to the prospect files, reliability and the updating of collected information.

B.3. Evaluating commercial efficiency

Sales directors must measure their commercial efficiency to identify strengths and weaknesses in their business activity and identify the best performance levers. To do this, they use indicators related to the prospect conversion rate, sales force effectiveness, and sales cycle duration. The commercial efficiency of a company must be monitored in real-time through performance indicators.

B.4. Calculate the cost of performance of salespeople

Sales managers must also manage their teams to strengthen their motivation and obtain optimal results over time. The human factor is an aspect that should not be neglected since it helps to build a productive work environment, thus contributing to the improvement of commercial performance. To calculate the performance cost of salespeople, it is necessary to use metrics related to:

- Human resources management.
- Training of sales teams.
- Individual motivation.

B.5. Align sales and marketing teams

Sales and marketing strategies are the pillars of commercial performance, and must work together: the goal is to align marketing objectives with sales objectives, to measure and improve the commercial performance of a company. This approach is called "smarketing," a fusion of the terms "Sales" and "Marketing."

Sales and marketing teams collaborate closely to meet the same business objective: to satisfy customers and collectively contribute to the success of the company. Thanks to the emergence of new tools, it is now easier for marketing directors or Chief Revenue Officers to effectively measure their actions. Teams can also establish an SLA, or Service-Level Agreement, an agreement that allows them to determine a specific level of service.

C. Strategies and tactics to improve commercial performance

there are several strategies and tactics that companies can implement to improve their commercial performance. we cite the following examples:

-Customer segmentation: Companies can segment their customers to better understand the needs and expectations of each segment and adapt their sales strategy accordingly. This can improve the relevance of products and services offered, as well as customer satisfaction and loyalty.

-Adopt an omnichannel approach: Companies can adopt an omnichannel approach to offer a consistent customer experience across all sales channels, whether physical stores, websites, social networks, or other communication channels. This can improve the efficiency and profitability of operations, as well as customer satisfaction and loyalty.

-Implement a customer relationship management (CRM) system: Companies can implement a customer relationship management (CRM) system to better track interactions with customers and improve the quality of relationships with them. This can optimize cross-selling and upselling, as well as retaining existing customers.

-Improve the quality of products and services: Companies can invest in improving the quality of their products and services to satisfy customers and stand out from the competition. This can increase customer satisfaction and loyalty, as well as the chances of recurring sales.

-Analyze commercial performance: Companies can analyze commercial performance to identify areas for improvement and growth opportunities. This can optimize investments and expenses, as well as identify actions to implement to better improve results.

-Invest in employee training and development: Companies can invest in the training and

development of employees' skills to improve their efficiency and productivity. This can optimize commercial performance, as well as improve employee satisfaction and retention.

-Innovate: Companies can innovate to offer innovative products and services and stand out from the competition. This can attract new customers, as well as retain existing customers and improve long-term commercial results.

Companies that succeed in implementing these strategies and tactics have better chances of succeeding in the market.

D. Obstacles and challenges of commercial performance

There are several obstacles and challenges to commercial performance that businesses may encounter. Here are some examples:

Competition: Competition can be fierce in certain markets, making it difficult to capture market share and increase sales.

Market changes: Changes in consumer preferences and buying habits, technological advancements, new regulations, etc, can complicate the task of businesses in terms of commercial strategy.

Economic fluctuations: Economic fluctuations can affect customer demand and solvency, which can impact the commercial performance of businesses.

Internal management issues: Internal management issues, such as inefficient processes, an unsuitable organizational structure, or communication problems, can hinder the commercial performance of businesses.

Resistance to change: Employees may resist changes, making it difficult to implement new strategies or tactics to improve commercial performance.

Product or service quality issues: Quality problems with products or services can reduce customer satisfaction and diminish commercial performance.

Lack of data or skills: Businesses may have difficulty collecting relevant data or possessing the necessary skills to analyze them and draw useful conclusions.

Businesses must be aware of these obstacles and challenges in order to anticipate and overcome them to maintain and improve their commercial performance.

Section 4: Commercial Performance in the Pharmaceutical Industry

A. the Specificity of Commercial Performance in the Pharmaceutical Industry

The pharmaceutical sector stands out from other sectors due to the unique nature of its activity and the associated challenges. Commercial performance in the pharmaceutical industry is therefore subject to specific requirements.

Firstly, the development and commercialization of Medications are subject to strict regulations aimed at ensuring the effectiveness and safety of pharmaceutical products. These regulations can have a significant impact on the commercial performance of pharmaceutical companies as they can delay the market release of Medications and limit marketing opportunities.

Moreover, the pharmaceutical sector is characterized by intense competition and increasing pressure on drug prices, particularly in high-income countries. Therefore, pharmaceutical companies must find ways to differentiate their products and maximize their commercial effectiveness to remain competitive in the market.

Partnerships also play an important role in the commercial performance of pharmaceutical companies. Partnerships with healthcare professionals, patient associations, and other companies in the sector can help pharmaceutical companies achieve their sales and marketing goals, expand their product portfolio, and access new markets.

Finally, supply chain management is also a key aspect of commercial performance in the pharmaceutical industry. The supply chain in the pharmaceutical sector is complex and may involve many actors, from the production of raw materials to the final distribution of drugs. Therefore, pharmaceutical companies must ensure the quality and safety of their products throughout the supply chain while minimizing costs and maximizing efficiency.

In addition to the elements mentioned previously, there are several other particularities to consider regarding commercial performance in the pharmaceutical industry, such as:

- Research and development (R&D) of new drugs is a long and costly process that can take years or even decades. Therefore, pharmaceutical companies must find ways to finance their R&D while ensuring a satisfactory return on investment.
- Patenting drugs is an important feature of the pharmaceutical sector because it allows companies to protect their innovations and obtain a monopoly on the production and commercialization of drugs for a limited period of time. This can also have an impact on drug prices and patient access to treatments.
- Pharmaceutical markets are often segmented based on geographical regions, diseases, therapeutic classes, and other factors. Therefore, pharmaceutical companies must adapt their commercial strategy based on the characteristics of each market and segment.
- The life cycles of pharmaceutical products can be relatively short, especially in the most competitive market segments. Therefore, pharmaceutical companies must be able to effectively manage the end of life of their products while developing new products to maintain their growth.
- Patients and healthcare professionals are important stakeholders in the pharmaceutical industry, as they influence treatment choices and purchasing decisions. Therefore, pharmaceutical companies must understand the needs and expectations of these stakeholders to develop effective products and commercial strategies.

B. Challenges and Opportunities for Commercial Performance in the Pharmaceutical Industry

There are numerous challenges and opportunities for commercial performance in the pharmaceutical industry. we present some significant elements:

B.1. Challenges:

- The increasing pressure on drug prices, particularly in developed economies, which can reduce pharmaceutical companies' profit margins and compromise their profitability.
- The rising R&D costs for new drugs, which can make it difficult to finance new research and

development projects.

- The changing drug reimbursement policies in some countries, which can make it harder for patients to access certain treatments.
- The growing competition in the generic drug market, which can reduce pharmaceutical companies' market share and revenue.
- The need to adapt to new technologies and changes in patient consumption habits.

B.2. Opportunities:

- The aging population in many countries, which increases demand for drugs for age-related illnesses.
- The growth of emerging economies, which opens up new markets for pharmaceutical companies.
- Innovation in the fields of biotechnology and personalized medicine, which offers new opportunities for drug development.
- The increasing demand for drugs for chronic diseases such as diabetes and cardiovascular diseases.
- Collaboration with other stakeholders in the healthcare sector, such as healthcare professionals and patient associations, to develop innovative solutions and improve patient access to treatments.

In addition to the challenges and opportunities mentioned above, the pharmaceutical industry also faces significant logistical challenges, such as supply chain management and drug inventory management.

To address these challenges, pharmaceutical companies often use specialized software such as Material Requirements Planning (MRP) and Warehouse Management Systems (WMS).

MRP is a raw materials planning system that allows companies to predict the necessary amounts of raw materials for the production of their drugs. WMS, on the other hand, is a warehouse management system that helps companies track the location of drug stocks and manage stock movements between different sites. The use of this software allows pharmaceutical companies to

better plan their production and reduce storage and transportation costs. In addition, the use of advanced technologies such as Radio-Frequency Identification (RFID) allows companies to track the movement of their stocks in real-time, which contributes to improving the visibility of the supply chain and reducing the risks of stock outs.

However, the adoption of these technologies can also pose challenges for companies, such as the need to train employees in the use of these new systems and the need to invest in communication infrastructures to connect different production and storage sites. Additionally, companies must be vigilant about cybersecurity, as computer systems can be vulnerable to cyber-attacks.

C. Key success factors for commercial performance in the pharmaceutical industry

The analysis of key success factors for commercial performance in the pharmaceutical industry has revealed that effective commercial teams must possess strong interpersonal skills to communicate effectively with healthcare professionals and become trusted partners. In addition, the ability to understand customer needs, anticipate market trends, and adapt to constantly evolving regulations is essential to ensure successful commercial performance.

Supply chain management, including stock planning, cost management, and logistics, is another key success factor. Strategic partnerships with key industry players, such as healthcare providers and healthcare professionals, can help strengthen the company's presence in the market and improve brand awareness.

Pharmaceutical companies must also be able to adapt their marketing and promotional strategy to digital channels to reach customers in an effective and innovative manner. Research and development are crucial to offering innovative and differentiated products that meet customer needs and improve the company's commercial performance.

Finally, a culture of innovation and collaboration can help pharmaceutical companies remain agile and quickly adapt to market changes

Conclusion

In conclusion, this introductory chapter has allowed us to understand the importance of commercial performance for the success and sustainability of a business. We have examined the evolution of research on commercial performance, the conceptual models, and the most commonly used indicators to evaluate commercial performance. Then, we addressed the conceptual analysis of commercial performance by examining the theoretical foundations, the levels of analysis, the dimensions, and the determinants of commercial performance. Lastly, we studied the commercial performance in the pharmaceutical industry by examining the specificities, challenges, opportunities, as well as the strategies and tactics to improve commercial performance in this rapidly evolving sector.

The following chapter will enable us to better understand how to overcome the challenges of commercial performance and the means to optimize it to ensure competitiveness and growth for businesses in the field.

Chapter 2

Order processing planning and production optimization

Chapter 2: Order processing planning and production optimization

Chapter Introduction

Order processing planning and production optimization are essential components of modern manufacturing processes. In today's fast-paced and competitive business environment, manufacturers are under increasing pressure to produce high-quality products quickly, efficiently, and at a lower cost. Order processing planning and production optimization help manufacturers achieve these goals by optimizing their processes, minimizing waste, and improving productivity.

In this chapter, we will examine in detail the planning of order processing and production optimization, focusing on the different types of planning and tools available, as well as discuss the impact of order and production management on a company's business performance. Specifically, we will delve into the planning of order processing within companies.

Chapter 2: Order processing planning and production optimization

Section 1: The Planning of the processing of raw material orders within the company

Effective planning of raw material orders is critical to the success of any manufacturing business. The ability to accurately forecast demand, manage inventory levels and coordinate the flow of materials throughout the production process is critical to ensuring finished goods are produced on time and at low cost. This section focuses on key concepts and strategies for planning raw material order processing within companies. It will cover topics such as demand forecasting, inventory management, order planning, and supply chain coordination, and provide insights into the tools and techniques used to optimize raw material processing and increase manufacturing efficiency.

We also demonstrate the main steps in planning company raw material order processing. Effective management of raw material orders is essential for any manufacturing company to achieve production goals and deliver high-quality products to customers.

A. Basic concepts of Raw Material planning:

A.1. Definition of planning

According to Peter Drucker planning is “The continuous process of making present entrepreneurial decisions systematically and with the greatest knowledge of the futurity;

organizing the effort needed to carry out these decisions and measuring the results of the expectations through adequate, systematic feedback “⁴³

Planning is the action of organizing over time a succession of actions or events in order to achieve a particular objective or project.⁴⁴

A.2. Objectives of planning

- ✓ The main objectives of planning are as below: ⁴⁵
- ✓ Planning increases the efficiency of an organization.
- ✓ It reduces the risk factors in modern business activities.
- ✓ It facilitates proper coordination within an organization.
- ✓ It aids in organizing all available resources.
- ✓ It provides the right direction for the organization.

A.3. The importance of planning in production

"Production planning aims to anticipate and plan the availability and use of resources (work teams, storage and transportation devices, machinery, labour, etc.); optimize costs; and have a production plan that is responsive to market fluctuations”, according to Erschler and Grabot.⁴⁶

Planning is critical in manufacturing because it allows companies to anticipate and prepare for potential challenges and opportunities. By developing a production plan, a company can ensure that it has the necessary resources, such as raw materials, equipment, and labour, to meet demand and achieve its production goals.

⁴³ « What Strategic Planning Is », Peter Drucker, Management. Tasks, Responsibilities, Practices, Heinemann, 1973, p. 125.

⁴⁴ <https://www.toupie.org/Dictionnaire/Planification.htm>

⁴⁵ <https://edukedar.com/planning-in-management/>

⁴⁶ J. Erschler et B. Grabot : Gestion de production. Hermes, Paris, 2001

A.4. Definition of raw materials

A substance in its natural state that will be used to make something else in an industrial process.⁴⁷ Another definition of raw materials states that they represent the input goods or inventory that a company needs to manufacture its products⁴⁸.

The Oxford Dictionary defines raw materials as “The basic material from which a product is made.”

Raw materials come in various forms and are utilized in numerous products. They are essentially the fundamental materials or stock that a business requires to produce its goods.

A.5. The classification of raw materials

Raw materials can be classified into various types depending on their origin and nature. Here are some common types of raw materials:

- **Primary Raw Materials:** sourced directly from natural resources, they are typically unprocessed or have undergone minimal processing before being used in manufacturing processes. Primary raw materials can be derived from a variety of sources, such as agriculture, mining, and forestry.
- **Secondary Raw Material:** According to the Law insider dictionary they are substances or materials recycled as a result of waste recovery operations. Meaning materials that have been recovered or recycled from waste and can be used as a substitute for primary raw materials in production processes. This reduces the dependence on virgin resources and helps conserve natural resources, as well as reduce the amount of waste going to landfills and contributes to a more sustainable economy. Some examples of secondary raw materials include recycled plastics, metals, glass, paper, and textiles.

⁴⁷ <https://dictionary.cambridge.org/dictionary/english/raw-material>

⁴⁸ <https://www.investopedia.com/terms/r/rawmaterials.asp>

A.6. Sources of Raw Materials

Depending on the type of material, raw materials can originate from a variety of sources. the most typical and common sources of raw materials are:

- ✓ **Animals** : Such as Shark cartilage; animal skin, bone, and tissue, milk, insects.
- ✓ **Plants**: such as cotton, wood and vegetables, leaves, flowers etc.
- ✓ **Minerals**: Such as natural gas, gasoline, metals, iron, gold etc

A.7. Importance of Raw Materials

Raw materials play an important role in the manufacturing of products and construction of industries, the production of all the products and machinery depends on it. Without access to raw materials, production would come to a halt, leading to economic disruption and reduced standards of living. The good quality of raw materials also increases the satisfaction of customers and the quality of the final product.

A.8. Definition of Raw Material Planning

Material planning is the process of figuring out what and how much is needed in order to produce goods within a specified timeframe, and ensuring the timely delivery of those materials. Accurate material planning can contribute significantly to the efficiency and profitability of a company.⁴⁹

Therefore, raw material planning is the process of analysing, forecasting, and determining the quantities and timing of raw materials needed for a manufacturing or production process.

B. Production planning:

Refers to the process of creating a detailed strategy for the production of goods within an organisation. It involves developing a plan about what type of products to produce, when to

⁴⁹ <https://manufacturing-software-blog.mrpeasy.com/5-tips-for-making-material-planning-more-effective/>

produce them, and the required quantity. The planning process involves developing a long-term view of overall production within the company.⁵⁰

When engaging in production planning, there are several factors that should be taken into consideration to ensure success. These include:

1. Customer demand: The production plan should be based on an accurate forecast of customer demand to avoid overproduction or underproduction.
2. Sales forecasts: A crucial factor that should be taken into consideration, it can help companies to anticipate future demand therefore avoid the previously mentioned underproduction or overproduction.
3. Resource availability: It should be taken into account, including the raw materials, equipment, and labour, to ensure that the production process can be completed as scheduled.
4. Production capacity: The manufacturing facility's production capacity should be considered with the ability to scale up or down as needed to meet demand.
5. Quality control: Measures for quality control are primordial to ensure that the finished product meets the required specifications and standards.
6. Cost-effectiveness: The plan should aim to minimise costs by optimising the use of resources and avoiding waste.

C. Raw Material Planning Process

After generating the production planning, a Raw Material Planning Process, or a material requirement plan should come next.

⁵⁰ <https://zensimu.com/skills/production-planning/>

A Material Requirements Planning (MRP) system accelerates the manufacturing production process by determining what raw materials, components and subassemblies are needed, and when to assemble the finished goods, based on demand and bill of materials (BOM).⁵¹

A bill of materials (BOM) is a comprehensive list of parts, items, assemblies, subassemblies, intermediate assemblies, documents, drawings, and other materials required to create a product.⁵²

Material Requirement Planning search to answer four main questions:

- ✓ What to produce?
- ✓ How many?
- ✓ When?
- ✓ How much?

By answering these questions, we can determinate what raw materials are needed and how many of it to satisfy the demand or the forecast.

C.1. The importance of Raw Material Planning process

Effective material planning can give a visibility into the inventory requirements needed to meet demand⁵³ and help businesses to optimise inventory levels, reduce waste, and minimise production delays or interruptions. By accurately forecasting demand and maintaining appropriate inventory levels, businesses can avoid stock outs or overstocking, which can lead to lost sales or excess costs. They can, furthermore, reduce the cost of materials and improve their overall profitability by working closely with suppliers to coordinate delivery schedules and negotiate favourable pricing.

⁵¹<https://www.netsuite.com/portal/resource/articles/inventory-management/material-requirements-planning-mrp.shtml#>

⁵²<https://www.arenasolutions.com/resources/category/bom-management/creating-a-bill-of-materials/>

⁵³<https://www.netsuite.com/portal/resource/articles/inventory-management/material-requirements-planning-mrp.shtml#>

D. Raw Material Inventory

Raw materials inventory is the total cost of all component parts currently in stock that have not yet been used in work-in-process or finished goods production.⁵⁴

Raw materials inventory is an important asset for any manufacturing or production-based company, as it represents the investment made in purchasing these materials that will be transformed into finished goods. However, companies need to be careful not to hold too much raw material inventory as this can tie up cash flow and increase storage and maintenance costs.

At the same time, too little raw material inventory can cause production delays, which can result in missed delivery deadlines and dissatisfied customers. Therefore, it is important for companies to strike a balance between keeping adequate raw material inventory levels and managing costs effectively.

D.1. Monitoring raw material inventory levels

Raw material inventory accounting is done before ordering raw materials to help a company make informed decisions about when and how much to order, it is essential for effective inventory management and production planning, as it helps companies to control costs, plan and forecast production, and maintain compliance with accounting standards and regulations.

By accurately accounting for raw material inventory, a company can determine the quantity of raw materials it has on hand, the cost of those materials, and how long they are expected to last. This information is crucial in deciding when to order more raw materials and in what quantities, it provides the data needed to forecast demand and plan production schedules. This helps a company to better manage its inventory levels and avoid stockouts or production delays.

⁵⁴ <https://www.accountingtools.com/articles/raw-materials-inventory>

D.2. Raw Materials Inventory Categories

Raw materials inventory can be categorised based on several factors, including the type of material, the source of the material, and the intended use of the material. There are two main categories:

Direct Raw material: refers to the raw materials that are incorporated or transformed into the finished product. For example, for a business that sells miniature paintings, the paint and canvases would qualify as direct raw materials inventory, as these materials are components of the final product⁵⁵

Indirect Raw material: these are materials that are not directly used in the production process but are necessary to support production operations. Examples include cleaning supplies, maintenance materials, or safety equipment.

E. Raw Materials Requisition

A material requisition, also known as a materials requisition form, or a material request, is a document used by the production department to request materials they need to complete a manufacturing process.⁵⁶

Raw material requisition is the formal process of requesting the materials needed for production from the inventory or purchasing department. It requires creating a requisition form or document that specifies the details of the raw materials needed, including the type, quantity, and expected delivery date to ensure having enough materials on hand to meet production demands and avoid delays and other issues.

The requisition form is typically created by the production department, responsible for completing the manufacturing process and lacks raw materials to do so.

⁵⁵ <https://www.shipbob.com/blog/raw-materials-inventory/>

⁵⁶ <https://planergy.com/blog/material-requisition/>

Figure N°08: Format of material requisition form

Materials Requisition						
A.B. Co. Ltd.						
Department					Serial No.	
Job No.					Date	
Qty.	Description	Code No.	Bin Card No.	Store Ledger Folio	Rate	Amount
Authorized by					Received by	
Storekeeper's Signature					Checked by	
Materials Abstract Prepared by						

Source : ⁵⁷

Section 2: Optimization of production, a true key success factor

In today's competitive business environment, companies are constantly seeking ways to improve their operations and gain a competitive edge. One area that has become increasingly important in recent years is the optimization of production processes. By streamlining production and reducing waste, companies can increase their efficiency, reduce costs, and improve the quality of their products. This section will explore the importance of optimization of production as a key success factor for companies, and will examine various principles, tools, and techniques that can be used to achieve this goal.

⁵⁷ <https://www.financestrategists.com/accounting/cost-accounting/material-costing/material-requisition/>
consulted in 3 April at 02:57

A. General

Production optimization refers to the process of improving the efficiency, productivity, and quality of production processes to achieve better outcomes with fewer resources. This can involve a range of techniques, tools, and methodologies, such as Lean Manufacturing, Six Sigma, Theory of Constraints, and others. The ultimate goal of production optimization is to eliminate waste, reduce costs, increase throughput, and improve overall performance all that while meeting customer needs and expectations. Therefore, by optimizing their production processes, companies gain a competitive advantage, improve profitability, and enhance customer satisfaction.

B. The principles of production optimization:

The principles of production optimization can vary depending on the specific approach or methodology used.

B.1. Value Chain

Michael Porter is credited with introducing the concept of the "value chain." In his definition, a company is basically a series of interrelated activities that transform inputs into outputs, which are then purchased by consumers.

The value chain can be also defined as “the breakdown of business activity into a sequence of elementary operations. It makes possible the identification of value-added operations (and non-value added ones) entering into the composition/production of the service/product, meeting the standards of the customer”.⁵⁸

In other words, the value chain is a fundamental tool for making a diagnosis of competitive advantage or for discovering the means of acquiring one and maintaining it.

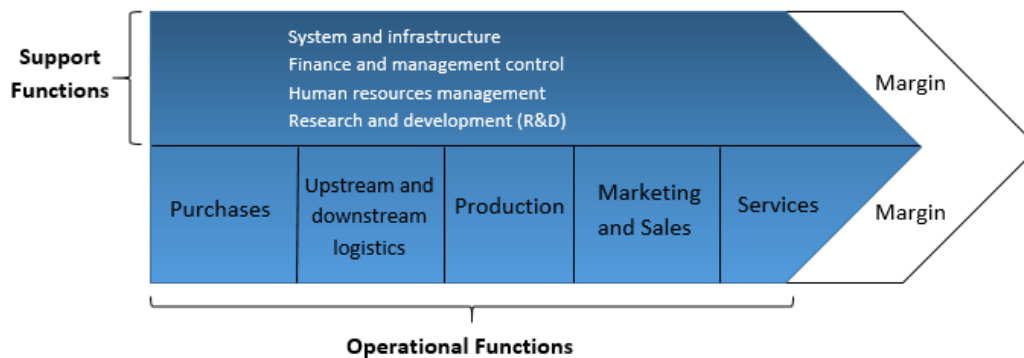
⁵⁸ S. LAMBER, G. ABDUL-NOUR, M-F. LORTIE, Mapping the value chain: Identifying value to obtain a competitive advantage, University of Quebec at Trois-Rivières

Value stream analysis involves breaking down the business into strategically important activities to understand their impact on cost behaviour and differentiation⁵⁹

B.2. Decomposition of the value chain

The value chain differentiates the company's activities into two types: the main activities which directly create value, and the support activities which allow the first to function.

Figure N°09: Mickel E. Porter Value Chain Model



Source : «Maxi fiches stratégie » , Manuel Cartier, H el ene Delacour, Olivier Joffre, 2010, P 35

B.3. The Theory of Constraints

The Theory of Constraints (TOC) is a management philosophy and methodology developed by Eliyahu Goldratt. The central premise of TOC is that every system, such as a business or manufacturing process, has at least one constraint or bottleneck that limits its performance. TOC aims to identify and alleviate these constraints in order to improve overall system performance.

⁵⁹ <https://www.lecoindesentrepreneurs.fr/chaine-de-valeur/> consulted in 4 April at 00:51

TOC focuses on three key principles: identifying the system's constraint(s), exploiting the constraint(s) to maximize throughput, and elevating the constraint(s) to increase the system's capacity. The methodology includes various tools and techniques, such as the Five Focusing Steps, which help organizations to identify and address constraints in their operations.

TOC has been applied in many industries and sectors, including manufacturing, healthcare, and logistics, and has been credited with improving productivity, reducing costs, and increasing profitability.

A successful Theory of Constraints implementation will have the following benefits:⁶⁰

- **Increased Profit:** the primary goal of TOC for most companies
- **Fast Improvement:** a result of focusing all attention on one critical area – the system constraint
- **Improved Capacity:** optimizing the constraint enables more product to be manufactured
- **Reduced Lead Time:** optimizing the constraint results in smoother and faster product flow
- **Reduced Inventory:** eliminating bottlenecks implicates less work-in-process

B.4. The Five Focusing Steps of Theory of Constraints

The Five Focusing Steps are a key component of the Theory of Constraints (TOC). They provide a framework for identifying and addressing constraints or bottlenecks that limit the productivity and efficiency of a system. Here are the Five Focusing Steps:

- a) **Identify the system's constraint(s):** The first step is to identify the bottleneck or constraint that is limiting the performance of the system. This could be a physical limitation, a policy or rule, or a behavioral pattern.

⁶⁰ <https://www.leanproduction.com/theory-of-constraints/>

- b) Decide how to exploit the constraint(s) to maximize throughput:** Once the constraint has been identified, the next step is to determine how to get rid of it. This might involve changing the way work is scheduled or prioritized, improving the quality of inputs, or increasing the speed of the constraint.
- c) Subordinate everything else to the constraint(s):** This step involves aligning all other activities in the system with the constraints. The objective is to ensure that all resources are focused on the bottleneck to maximize the throughput.
- d) Elevate the constraint(s) by investing in additional resources or capacity:** If exploiting and subordinating the constraint is not enough to increase throughput, the next step is to invest in additional resources or capacity. This could involve hiring more staff, purchasing new equipment, or changing the layout of the system.
- e) Repeat the process by identifying the new constraint(s):** Once the constraint has been elevated, the process starts again with the identification of the next bottleneck or constraint. This is an ongoing process of continuous improvement, in which the system is continually optimized.

B.5. Lean Methods

Jim Benson of Modus Cooperandi defines Lean methodology as follows “Lean is both a philosophy and a discipline which, at its core, increases access to information to ensure responsible decision making in the service of creating customer value.”

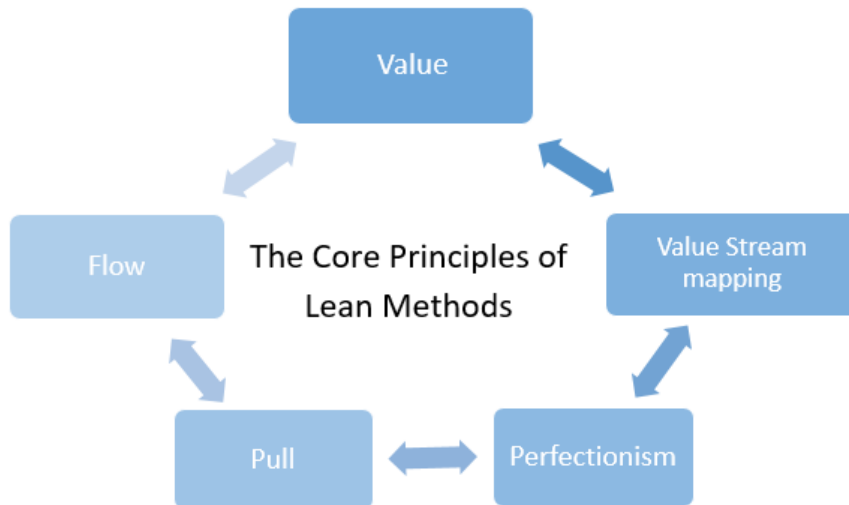
Lean methodology is a management philosophy and a set of practices designed to minimize waste and maximize value in a production process. It was first developed by Toyota in the 1950s and has since been adopted by many other organizations.

B.6. The core principles of Lean Methods

Lean Method's core principle mainly focuses on creating value for the customer by eliminating waste and reducing the time it takes to deliver a product or service. The five basic principles of

lean methodology are:

Figure N°10: The Core principals of Lean Method



Source : ⁶¹

- a) **Value**—Understanding what the customer is willing to pay for. Value is always defined by the customer and is categorized in three ways: non-value adding activity (waste), value adding activity, and business value adding activity.
- b) **Value stream mapping**—Mapping the process, steps, or sequence that a product or service goes through in a company.
- c) **Flow**—Allowing product and information requests to flow smoothly through the business without delay or disruption.

⁶¹ <https://leanmethods.com/resources/articles/what-is-lean/> consulted in 3 April at 01:52

- d) **Pull**—Replacing only material that is used and eliminating excessive inventory, which allows responding quickly to customer requirements.
- e) **Striving for perfection**—Always striving to optimally eliminate waste and improve the value provided to customers.

C. Production optimization tools and techniques

Production optimization tools and techniques refer to a range of methodologies, strategies, and tools that are used to enhance the efficiency, productivity, and profitability of a production process. These tools and techniques can be applied to a variety of industries, including manufacturing, logistics, and service delivery.

There are various tools and techniques that can be used to optimise production processes, the following are worth mentioning:

C.1. Six Sigma

Six Sigma is a methodology and philosophy for process improvement that was first introduced by Motorola in the 1980s. The approach is focused on identifying and reducing defects in a process, with the goal of achieving a level of quality that is 99.9997% defect-free.

The term "Six Sigma" refers to the statistical measure of variability, which represents the degree of deviation from a process mean. By reducing variability in a process, Six Sigma aims to reduce defects and improve quality.

the Six Sigma methodology is a source of increased profitability for the company by accumulating the following effects:⁶²

- ✓ a reduction in rejects, rework and more generally, non-quality costs;
- ✓ an improvement in the availability of machines and the rate of synthetic yield (TRS);

⁶² « Six Sigma, Comment l'appliquer », Maurice Pillet, Paris, P02

- ✓ better market shares following the improvement of product quality

The Six Sigma methodology uses a data-driven approach to identify and eliminate defects, using a structured process called DMAIC, The DMAIC model is a structured approach to problem solving, widely used in the Lean Six Sigma approach. It provides a basis for reflection that structures the work of a continuous improving project team. This simple tool allows quickly obtaining convincing results, and is based on 5 steps:⁶³

- ✓ Define: Defining the problem or opportunity needing improvement and setting clear goals.
- ✓ Measure: Collecting data on the current process and establishing a baseline performance metric.
- ✓ Analyze: Analyzing the data to identify the root cause of defects and inefficiencies.
- ✓ Improve: Developing and implementing solutions to address the root cause of the problem.
- ✓ Control: Establishing control measures to monitor the process and ensure that improvements are sustained over time

C.2. Value Stream Mapping (VSM)

"The Value Stream Mapping, or VSM, In the context of production and supply chain management, allows the visualization of all stages of production for a product or service, from the procurement of raw materials to delivery to the final customer. This mapping allows for the highlighting of the different steps in the process, information and material flows, lead times, stocks and value-added activities.

Its objective is to simplify and optimize production processes by identifying low-value or unnecessary activities and seeking to eliminate or reduce them. This technique improves

⁶³ « A la découverte du Lean Six Sigma », F. FOUQUE, Edition Fouque, 2009

significantly efficiency, quality, and profitability of production processes, all the while reducing costs and production lead times.

C.3. Value Stream Mapping Methodology

The VSM tool has emerged as a method aimed at identifying sources of waste in individual value chains, that is, for a specific product or product family, it requires the following;

Going to the field and understanding the sequence of tasks. Documenting what is and not what the procedures say how it should be. Indeed, there can be a difference between the written and the executed.

Making observations and descriptions objective: establishing the ratio of tasks to VA/total tasks. This ratio is calculated as a ratio of time spent for the different tasks.

Summarizing to communicate simply around the elements collected: make a visual description of the process, and relying on a plan of the company to see the circuits of materials, data and people.

Analyzing the process: For each task, the questions: "Does this task have added value?", "Where is the added value for the customer?", "If it has no added value, is it necessary for the company or not?" should be asked. Including the tasks that have waiting times.

- ✓ If a task has an added value, it will not be touched or it will be improved.
- ✓ If it has no added value but is necessary: reduce durations, times, distances, costs.
- ✓ If a task has no added value and is not necessary, it will be discarded.
- ✓ Building a future state and recalculating the ratio of value-added tasks to total tasks (in time) is also needed.

- **Defining an action plan:** what actions should be taken, when and by whom to achieve the objective of the modifications?

- **Implementing and following:** The actions selected and validated by the hierarchy among those presented in the action plan are implemented and monitored. After a defined period, a balance sheet is made. The approach can be repetitive in the same process.

C.4. Just-In-Time

Just-in-time is a production strategy in which products are only produced when requested by customers and whose the goal is to reduce inventory, increase flexibility and maximise client satisfaction⁶⁴

Just-in-time strategy aims to optimize efficiency by producing products or services in the exact amount needed, precisely when they are needed, and in the exact sequence required to complete the overall production process.

C.5. Just-In-Time Methodology

The methodology of the Just-In-Time (JIT) method involves several key principles and practices, including:

- 1. Pull-based production:** The production process is driven by customer demand rather than a forecast. This means that production is only initiated when a customer places an order, and products are made in response to that order. This helps reduce excess inventory and waste.
- 2. Continuous flow:** The production process is designed to achieve a continuous flow of materials and products through the manufacturing process, without any delays or bottlenecks. This requires careful coordination of production processes and efficient scheduling of materials and resources.
- 3. Takt time:** Defined by the rate at which products need to be produced to meet customer demand. Takt time is calculated by dividing the total available production time by the

⁶⁴ Melek, E. Fikri, P. (2008). The effect of competition, Just in Time production and Total Quality Management on these multiple performance measures: An empirical study, Journal of Economic and Social Research, p.35-72.

customer demand for a specific period. The goal is to produce products at the rate of takt time to avoid overproduction.

4. **Kanban system:** A visual signaling system that is used to ensure that materials are available when needed for production. The Kanban system involves using cards or other visual cues to signal the need for more materials or components. This helps ensure that materials are available when needed, and reduces the need for excess inventory.
5. **Quality control:** JIT emphasizes the importance of quality control throughout the production process. Each stage of the production process is carefully monitored to ensure that the quality of the final product meets customer expectations.

By implementing these principles and practices, companies can reduce waste, improve efficiency, and increase customer satisfaction. However, implementing JIT can be challenging and requires careful planning, coordination, and continuous improvement.

D. The impact of Optimizing Production

Optimizing production is a critical process for maximizing efficiency and productivity in manufacturing or service environments. It involves streamlining workflows, reducing waste, and improving quality control to achieve greater output and profitability.

Its benefits are numerous and lead to significant cost reduction, improved quality control, faster turnaround times, and increased competitiveness. By reducing waste and inefficiency, companies can lower their costs, improve their bottom line, and fuel growth. This also enhances their reputation for quality, which can help attract and retain customers.

Section 3: The main tools for order planning and production optimization

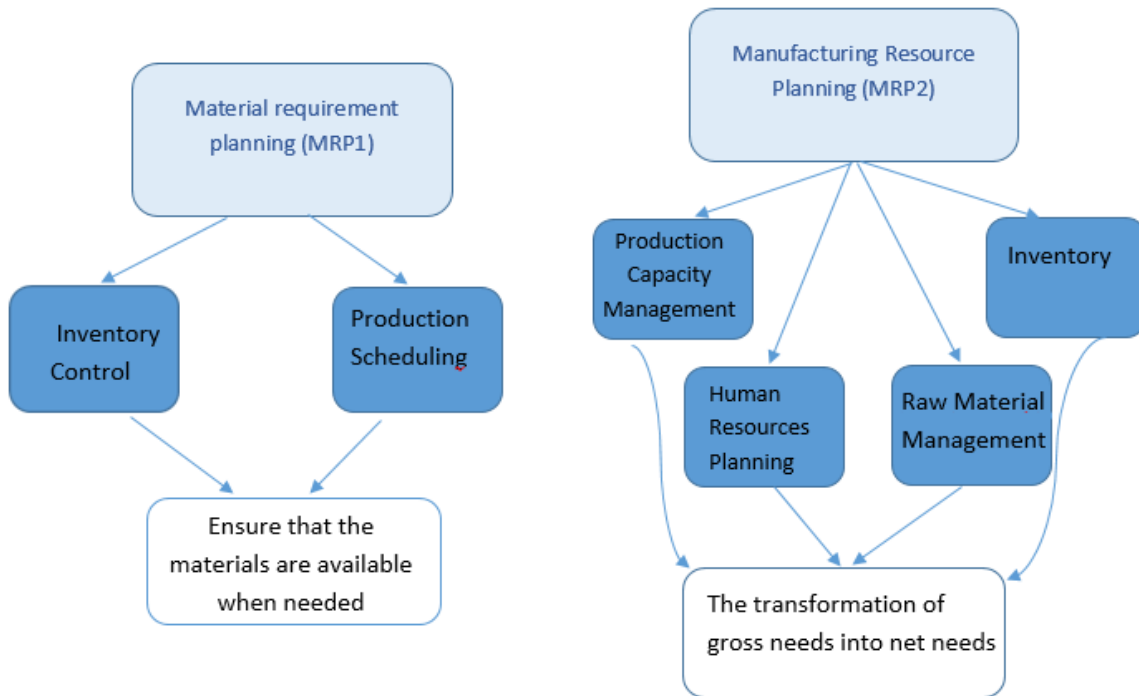
Order planning and production optimization are critical processes for any manufacturing or service environment. To achieve the highest levels of efficiency and productivity, businesses must employ a range of tools and techniques commonly used to plan and optimize production, such as Material Requirements Planning (MRP), Manufacturing Resource Planning (MRP II), Supply Chain Management (SCM), and Enterprise resources planning (ERP).

A. Material Requirements Planning (MRP)

Professor Guillermo Galego the ex-Chair Professor of the Department of Industrial Engineering and Decision Analytics (IEDA) at the Hong Kong University of Science and Technology (HKUST) defined Material Requirement Planning (MRP) as a computer-based production planning and inventory control system. MRP is concerned with both production scheduling and inventory control. It is a material control system that attempts to keep adequate inventory levels to assure that required materials are available when needed.

The MRP (Materials Requirement Planning) is a method of management and planning of production in pushed flow, presented officially in 1965 and was at that time only a method of calculation of the needs in materials. It made possible the determination of the quantities of each part to be supplied for components and finished products, while taking into account demand and delivery times. But this MRP method has a weakness since it does not take into consideration the resources available to a company (machine capacity, human resources, etc.).

Figure N°11: Materials Resources Planning 1 et manufacturing resource planning 2



Source: Source: Created by the authors

B. Material Requirement Planning II (MRP II)

In the 1980s, MRP evolved into MRP II (Manufacturing Resource Planning), which added production capacity management and human resource planning to inventory and raw material management. This supply logic is based on a transformation of gross needs into net needs

(MANAGEMENT ON NEED), by using nomenclatures, taking into account stocks, ongoing supplies, and applying predefined management rules.⁶⁵

The MRP system distinguishes between two types of orders:

Forecast orders: are production or purchase orders that are forecasts based on future demand. These forecasts can be based on historical data, market trends, economic forecasts, etc.

Firm orders on the other hand, are production or purchase orders that are based on firm orders from customers or company management. These orders are considered firm commitments and cannot be changed or cancelled without mutual consent between the parties involved.

B.1. The categories of company needs according to MRP:

The MRP method (Material Requirements Planning) makes it possible to separate the needs of the company into two main categories:⁶⁶

Independent needs: Represent the external needs expressed by customers such as firm orders for finished products or sales forecasts estimated by the sales department;

Dependent needs: Represent the internal needs for materials and components necessary for the manufacture of finished products or final references. They are calculated on the basis of the nomenclature.

B.2. The main MRP information system files

The main master data used by MRP is detailed in the article on production management technical data. The main files that make up the MRP information system are presented as :⁶⁷

- ✓ **The sales forecast file:** It contains data on the future needs of customers, and is regularly updated by the company's sales department;

⁶⁵ https://www.mcours.net/cours/pdf/econm/MRP_Management_des_Ressources_de_Production.pdf

⁶⁶ <http://www.logistiqueconseil.org/Articles/Gestion-production/Methode-mrp.htm>

⁶⁷ <http://www.logistiqueconseil.org/Articles/Gestion-production/Methode-mrp.htm>

- ✓ **The file of firm orders:** It contains orders confirmed by customers.
- ✓ **The references file:** It contains all the references used in the process of manufacturing or assembling the final references.
- ✓ **The inventory file:** It presents in real time the state of stocks throughout the production chain.
- ✓ **The PDP files.** Master Production Schedule files that present the gross needs in finished products.
- ✓ **The BOM file.** It contains the general tree structure of the articles database.

C. Supply Chain Management

The definition of supply chain management (SCM) by Oliver, and Webber 1982 is designated the process of planning, implementing, and controlling the operations of the supply chain with the purpose to satisfy customer requirements as efficiently as possible. Supply chain management includes all movement and storage of raw materials, work-in-process inventory, and finished goods from point-of-origin to point-of-consumption.

Supply Chain Management (SCM) is a process that involves managing all activities related to the supply chain of a company, from the procurement of raw materials to the distribution of finished products to customers. It is a complex process that involves the coordination of multiple stakeholders, including suppliers, manufacturers, distributors, carriers, and customers. The main objective of SCM is to optimize the efficiency and profitability of the supply chain while meeting the needs of customers.

C.1. Supply Management Stages

The stages of the Supply Chain Management (SCM) process can be summarized as:

- a) **Demand Planning:** Involves predicting customer demand for the products or services of the company. This step helps the company to determine the necessary production levels and delivery times.

- b) **Procurement Management:** Involves purchasing the necessary raw materials, components, and already processed products for production. It requires selecting suppliers based on their ability to provide quality products within the required time and at the right price.
- c) **Production Management:** This stage involves planning production to meet the forecasted demand. Production levels are adjusted based on sales forecasts and available inventory.
- d) **Inventory Management:** it Involves managing stock levels to ensure that products are available in sufficient quantity to meet customer demand without having too much excess stock.
- e) **Logistics Management:** Involves managing the delivery of products to customers. It includes selecting the most efficient and cost-effective transport options.
- f) **Customer Relationship Management:** Involves managing the relationship with customers to ensure that they are satisfied with the products and services provided.
- g) **Reverse Logistics:** This stage involves managing the return of defective or unwanted products from customers back to the company. Including the processes of returns management, refurbishment, and disposal of products.

Overall, the SCM process entails the coordination of multiple stakeholders and processes across the entire supply chain, from suppliers to customers. The ultimate goal is always to optimise the efficiency and profitability of the supply chain while meeting the needs and expectations of customers.

D. Enterprise resources planning (ERP)

The first true ERP system emerged in the 1990s, which integrated MRP with other business functions. The 2000s witnessed the evolution of ERP systems with the advent of cloud computing, mobile devices, and artificial intelligence. Now, there is a wide range of ERP systems available.

Enterprise Resource Planning (ERP) is a comprehensive and integrated information system that allows a company to manage all of its business processes, it is designed to provide a centralized database that can be accessed by all users within an organization. This enables different departments to share information and collaborate more effectively, leading to better decision-making and improved business processes.

ERP is based on the conception of software applications of the company in the form of independent modules. The communication of data between multiple apps is allowed thanks to the common database that those modules share.⁶⁸

ERP systems are often implemented in phases, with different modules being rolled out over time. This allows companies to gradually integrate the system into their operations, minimize disruption, and ensure that users are properly trained and prepared for the changes.

D.1. Characteristics Enterprise Resources Planning (ERP)

Here are some of the characteristics of an ERP system:

- ✓ **Integration:** An ERP system integrates all of an organization's business processes into a single, unified system.
- ✓ **Modularity:** ERP systems are modular, allowing organizations to customize the system to meet their own specific needs.
- ✓ **Centralized database:** ERP systems use a centralized database to store all of an organization's data, making it easier to access and share information across departments.
- ✓ **Real-time information:** ERP systems provide real-time information on all of an organization's business processes, allowing managers to make informed decisions quickly.

⁶⁸ « Conception, réalisation et intégration d'un module ERP de gestion en ligne de l'examen d'accréditation des visiteurs médicaux », Dahmani Katia Belkacem Melissa, Mémoire de Master, Université Mouloud Mammeri 2016/2017, P15.

- ✓ **Standardization:** ERP systems help organizations standardize their business processes, leading to increased efficiency and productivity.
- ✓ **Scalability:** ERP systems are scalable, allowing them to grow with an organization as it expands.
- ✓ **Security:** ERP systems have robust security features to protect sensitive data and prevent unauthorized access.
- ✓ **Accessibility:** ERP systems are accessible from anywhere, as long as there is an internet connection, allowing remote teams to work together seamlessly.

ERP system provides a comprehensive solution for managing all aspects of an organization's operations, from finance and accounting to inventory and supply chain management.

E. The importance of the tools of order planning

Order planning tools are crucial for any organization that wants to improve its production processes, they enable organizations to identify and respond to changes in demand quickly. And helps them monitor their sales trends, identify potential shifts in customer demand, and adjust their production schedules accordingly. By doing so, organizations can reduce lead times, minimize inventory costs, and improve customer satisfaction.

Order planning tools also help organizations to reduce the risk of production errors and quality issues. These tools enable tracking the production of each order, ensuring that each product is produced to the correct specifications and meets the required quality standards

Finally, order planning tools can also help organizations to improve their supply chain management and optimize their production. They help track their orders and monitor their suppliers' performance, identifying potential supply chain issues and responding to them proactively.

F. The impact of the tools of order planning on the production optimization

One of the critical ways in which order planning tools impact production optimization is through accurate forecasting. These tools help organizations forecast demand and plan their production schedules accordingly, which ensures that the right materials, equipment, and personnel are available at the right time.

Efficient scheduling is also critical for production optimization, and order planning tools can help organizations achieve it. By identifying bottlenecks and optimizing workflows, these tools enable organizations to schedule their production processes more efficiently. Efficient scheduling reduces downtime, saves costs, and ensures that production schedules are met within the specified timelines.

Better inventory management is another way in which order planning tools impact production optimization. Effective inventory management ensures that the right inventory levels are available at the right time, reducing lead times and avoiding stock outs. This, in turn, optimizes production processes and improves efficiency.

Improved communication is also vital for production optimization, and order planning tools facilitate communication between different departments and functions the most. This ensures that everyone is on the same page, avoiding errors and improving efficiency. It results in reducing the likelihood of mistakes and ensuring that all teams are working together towards the same goals.

Section 4: The impact of order and production management on a company's sales performance

The way a company manages its orders and production processes can have a significant impact on its sales performance. When an organization manages its orders and production efficiently, it guarantees accurate products availability when customers need them, enhancing customer satisfaction. Efficient order and production management also helps organizations minimize production errors and defects, reducing the risk of product returns and customer complaints. By doing this, organizations can maintain their reputation, increase customer loyalty, and improve their sales performance over time.

A. The importance of efficient order and production management for meeting customer demand:

The importance of efficient order and production management for meeting customer demand cannot be overstated. In today's fast-paced business environment, customers expect high-quality products, delivered quickly and at a reasonable price. And failure to meet these expectations can lead to lost sales opportunities and risk losing customers and market share, besides the damage of the company's reputation. Therefore, efficient order and production management is essential for meeting customer demand because it enables companies to produce and deliver high-quality products in a timely manner and at a competitive price.

Here are some specific reasons why efficient order and production management is important for meeting customer demand:

- a) **Meeting changing customer needs:** Customer demand can change rapidly, and companies that are not able to respond quickly risk losing customers. It is needed to ensure responding quickly to changes in customer demand and adapting production processes accordingly.

- b) **Reducing costs:** reducing costs by minimizing waste, improving productivity, and optimizing supply chain is important because these cost savings can be passed on to customers in the form of lower prices, which can help companies stay competitive in the market.
- c) **Improving product quality:** Ensuring that production processes are standardized and closely monitored can help companies reduce defects and customer complaints, and improve customer satisfaction.
- d) **Meeting delivery deadlines:** Customers expect their orders to be delivered on time, and efficient order and production management can help companies meet these deadlines, which improves customer satisfaction and maintains a positive reputation for the company.
- e) **Increasing profitability:** Reducing costs and improving efficiency can help companies reinvest in their business and continue to improve their operations to better meet customer demand.

B. Minimizing lead times and improving customer satisfaction through effective order and production management

Minimizing lead times and improving customer satisfaction are two critical goals to remain competitive in today's business environment. Effective order and production management is essential to achieving these goals.

One key strategy for minimizing lead times and improving customer satisfaction is to optimize inventory management, meaning closely monitoring inventory levels and adjusting production processes to ensure that products are available exactly when customers need them.

Another strategy is to improve production efficiency by eliminating bottlenecks and other inefficiencies in the production process to increase output and reduce lead times. By using techniques such as lean manufacturing, businesses can streamline their production processes and reduce costs while improving product quality.

Effective communication is another crucial point as communicating with suppliers, vendors, and logistics providers, can ensure timely delivery of materials and products, reducing the likelihood of stock outs or production delays.

C. Reducing production errors and defects to maintain brand reputation and increase customer loyalty

It is essential to implement a quality control system to reduce production errors and defects, and to invest in employee training and development. By providing employees with the training and tools they need to identify and prevent errors and defects, businesses can improve the overall quality of their products and reduce the likelihood of defects or errors. As well as automating repetitive tasks and using robotics to perform the complex ones.

Implementing a continuous monitoring of production processes and identifying areas for improvement is also critical for reducing errors over time.

D. Effective inventory management to reduce storage costs and minimize the risk of stock outs

Effective inventory management reduces storage costs and minimizes the risk of stock outs. Companies that hold excessive inventory face high storage costs and tie up capital that could be used for other purposes, while companies that do not hold enough inventory risk stock outs that can lead to lost sales and dissatisfied customers.

This is some steps to have an effective inventory management:

- ✓ **Use inventory forecasting tools** to accurately predict demand, by analyzing historical sales data and other factors that may influence demand, businesses can make informed decisions about how much inventory to hold and when to order more.
- ✓ **Implement a just-in-time (JIT) inventory system.** This involves ordering inventory only when it is needed, rather than holding excess inventory on hand. By using JIT inventory, businesses can reduce storage costs and minimize the risk of overstocking.

- ✓ **Using barcode scanning and other technologies to track inventory levels**, by automating the inventory tracking process, businesses can more accurately monitor inventory levels, reorder inventory when needed and avoid stock outs.
- ✓ **Implementing a vendor-managed inventory (VMI) system** is another effective strategy for inventory management. It involves having suppliers manage inventory levels on behalf of the business. By allowing suppliers to manage inventory, businesses can reduce the risk of stock outs and free up resources that would otherwise be used to manage inventory

E. Enhancing production efficiency through streamlined order and production management to drive sales growth

Enhancing production efficiency through streamlined order and production management is key to driving sales growth for companies. By improving production efficiency, businesses can increase their output and reduce their costs, allowing them to produce more products at a lower cost and potentially pass those savings on to customers, thereby driving sales growth.

One strategy to enhance production efficiency is to implement a lean manufacturing approach, by identifying and eliminating waste in the production process, such as excess inventory, unnecessary motion, and overproduction. By streamlining the production process and eliminating waste, companies can increase production efficiency and reduce costs.

Implementing a just-in-time (JIT) inventory system, rather than holding excess inventory on hand, using automation and robotics in production processes, and using data analytics to monitor and improve production processes that can help businesses identify areas for improvement and optimize production efficiency, are examples of other strategies that are proved helpful overall in enhancing production efficiency through streamlined order and production management and for companies to optimize their production processes and achieve their objectives.

F. Benefits of an efficient order and production management

One of the most important benefits is improved customer satisfaction. By streamlining their operations, companies can ensure that products are delivered on time and with the right quality, which can lead to higher levels of customer satisfaction. Another benefit is reduced costs. By optimizing production processes and streamlining operations, companies can reduce their costs and improve their bottom line. This, in turn, helps companies remain competitive in the market.

Efficient order and production management also enables better inventory management, so they can reduce the likelihood of stock outs or overstocking, which can help them operate more efficiently. Furthermore, they can increase production efficiency. By eliminating bottlenecks and other inefficiencies in the production process, improved supply chain management. And by managing their supply chain more effectively, the companies can improve responsiveness to changes in demand.

G. Challenges of efficient order and production management

Achieving efficiency in order and production can present several challenges that businesses must overcome, we state the following:

Balancing demand and supply: Meeting customer demand while maintaining the right inventory levels can be a challenge. Businesses must ensure they have the right materials and resources to produce products on time, while also avoiding overstocking.

Forecasting demand accurately: Accurately forecasting demand is crucial for efficient order and production management. Businesses need to anticipate changes in demand and adjust production accordingly to avoid overproduction or stock outs.

Managing complex supply chains: Supply chains can be complex, involving multiple suppliers, vendors, and logistics providers. Managing these relationships and ensuring timely delivery can be challenging.

Optimizing production processes: Optimizing production processes requires continuous improvement and investment in technology and training. Businesses must constantly monitor and adjust their processes to improve efficiency and reduce costs.

Managing and analyzing data: Efficient order and production management relies on data analysis and decision-making. However, managing and analyzing data can be challenging, especially for businesses with limited resources.

Ensuring quality control: Quality control is critical to maintaining customer satisfaction and brand reputation. However, ensuring consistent quality across all products can be challenging, especially for businesses with complex supply chains.

Conclusion

Order processing, planning and production optimization play a critical role in achieving organizational success after overcoming the obstacles or commercial performance discussed in the previous chapter. These processes involve careful planning, execution, and monitoring to ensure that the final products are produced efficiently and delivered to customers on time. By using data analysis and technology to automate and optimize production processes, businesses can improve quality, reduce lead times, and boost productivity. Moreover, effective order processing planning and production optimization can help businesses remain competitive and adapt to changing market demands. Therefore, it is essential for companies to prioritize these processes and continuously evaluate and improve them for sustained success.

**Chapter III the Role of MRP in Improving
Business Performance in Hikma
Pharmaceutical Company**

Chapter III: The Role of MRP in Improving Business Performance in Hikma Pharmaceutical Company

Chapter Introduction

In this chapter, we will study the impact of implementing Material Requirements Planning (MRP) on the business performance of Hikma Pharmaceuticals. We will examine how MRP has improved the management of raw material orders by reducing delivery lead times and avoiding stock outs. Additionally, we will analyze how this approach has optimized production by reducing costs.

In addition to quantitative analysis, we have used Value Stream Mapping (VSM) to complement our MRP-based approach. VSM allows us to gain an overview of the value stream and identify non-productive activities and inefficiencies to improve operational efficiency.

We have also conducted qualitative interviews with key stakeholders to understand their perceptions and measure the impact of this combined approach on the company's business performance.

In summary, this chapter aims to determine whether the implementation of MRP, in conjunction with VSM, has genuinely enhanced the business performance of Hikma Pharmaceuticals. We will highlight the advantages, disadvantages, and challenges encountered during the implementation of this approach. We will also consider other factors, such as machine capacity, to provide a comprehensive view of the optimization of the company's operations.

Chapter III: The Role of MRP in Improving Business

Performance in Hikma

Pharmaceutical Company

Section 1: Presentation of the company and the hosting structure (Hikma Pharmaceuticals)

A. Hikma Worldwide:

Hikma Pharmaceuticals is a Jordanian-based pharmaceutical company, operating as a Limited Liability Company (LLC), with its headquarters located in London.

The company Hikma Pharma was founded in 1978 in Amman, Jordan, by Samih Darwazah. In its early years, the company focused on developing a branded pharmaceutical business throughout the Middle East and North Africa (MENA) region. Then, in the early 1990s, Hikma expanded beyond the MENA region through the acquisition of other generic pharmaceutical companies in the United States and by establishing injectable pharmaceutical operations in Portugal.

Since then, the company has experienced significant growth, both organically and through acquisitions. This has been achieved by establishing a global presence in countries such as Italy, Germany, Tunisia, Egypt, Jordan, and Saudi Arabia.

Today, Hikma is a pharmaceutical manufacturer with a wide range of generic and branded products. Its annual revenue in 2019 was \$1.9 billion, and it operates in the Middle East, North

Africa (MENA), and the United States. Hikma provides nearly 700 products to patients worldwide, aiming to improve their quality of life and meet their healthcare needs.

The company has 7 research and development centers, 30 production facilities, and its products are sold in over 50 countries, covering a diverse range of products. The diversity of its business model, market presence, and product offerings, combined with its long-term commitment to quality investment, are integral to its success.

B. Hikma in Algeria:

Hikma Pharmaceuticals has been operating in Algeria since 1994 in the field of medicine imports, serving public health institutions and professional societies in Algeria. The company later expanded its operations to include local production by opening its first manufacturing facility in Staoueli (Algiers). Hikma operates in accordance with international pharmaceutical industry standards and has obtained multiple licenses from the U.S. Food and Drug Administration (FDA). It is the fourth-largest pharmaceutical producer in Algeria.

Currently, Hikma Pharma Algeria has four manufacturing units equipped with modern extrusion lines and state-of-the-art technology, as well as spacious and functional warehouses and storage areas. With a workforce of over 700 employees and a portfolio of more than 90 medical products on the market, the company actively contributes to the healthcare industry in Algeria.

B.1. Historical Overview:

- In 2006: The acquisition of the first factory in Staoueli (Algiers), which currently employs approximately 320 people. With an estimated investment of \$7.5 million, the Hikma-Algeria factory is the fifth factory of the Hikma group worldwide, following those in the USA, Portugal, Tunisia, Saudi Arabia, and Jordan. It has a production capacity of ten million units per year.
- In 2009: The listing of Hikma's shares on the London Stock Exchange.

- In 2011: The Company launches its second factory in Sidi Abdellah, specialized in the production of penicillin products, with a notable production capacity of 20 million vials per year.
- In 2017: The acquisition of a third factory in Baba Ali exclusively dedicated to the production of cephalosporin antibiotics.
- In 2019: The acquisition of a new production unit in Staoueli specialized in oncology, a first in Algeria

B.1.1 Production Sites

Hikma Pharma Algeria has four production sites: one for general formulation, one for penicillin, one for oncology, and one for cephalosporin.

- The Staoueli site specializes in the production of cardiovascular and neurological medicines.
- Al Dar Arabia, located in Rahmania, is dedicated to antibiotics (e.g., Amoclan).
- The Bab Ali site specializes in cephalosporin.
- The oncology site, also located in Staoueli, is currently under construction.

B.1.2 Group's Strategic Vision:

- The company's primary goal is to provide quality products that are affordable for everyone.
- In terms of its growth strategy, the company aims to strengthen and expand its production, sales, and marketing network nationwide. It also seeks to increase its production capacity, diversify its product range, and fully satisfy its customers through effective quality management processes.
- Diversifying the production portfolio is also a key priority for the company, which involves developing new generic medicines and maintaining continuous technological advancements. Additionally, the company continues to establish partnerships with recognized national and international laboratories.

- Ensuring improved access to medications for customers is another commitment of the company, which involves guaranteeing availability and reasonable pricing.
- Furthermore, a major undertaking for the company is to export distinctive Algerian products to the Maghreb region and other markets, with an ambitious target of reaching 40 countries. Ultimately, the company aims to expand its export of locally manufactured medicines to Africa and Europe, marking a significant milestone in its development.

C. Distribution Network of HPA

Indeed, the distribution network for medications can vary depending on the types of clients. For Hikma Pharma Algeria, the clients consist of retail pharmacies, healthcare institutions such as hospitals and clinics, as well as the PCH (Central Pharmacy of Hospitals).

It is important to note that the medication supply procedures differ based on the clients. Hospitals and clinics, for example, generally go through the PCH to procure medications. The PCH is an organization responsible for supplying hospitals with medications and medical devices.

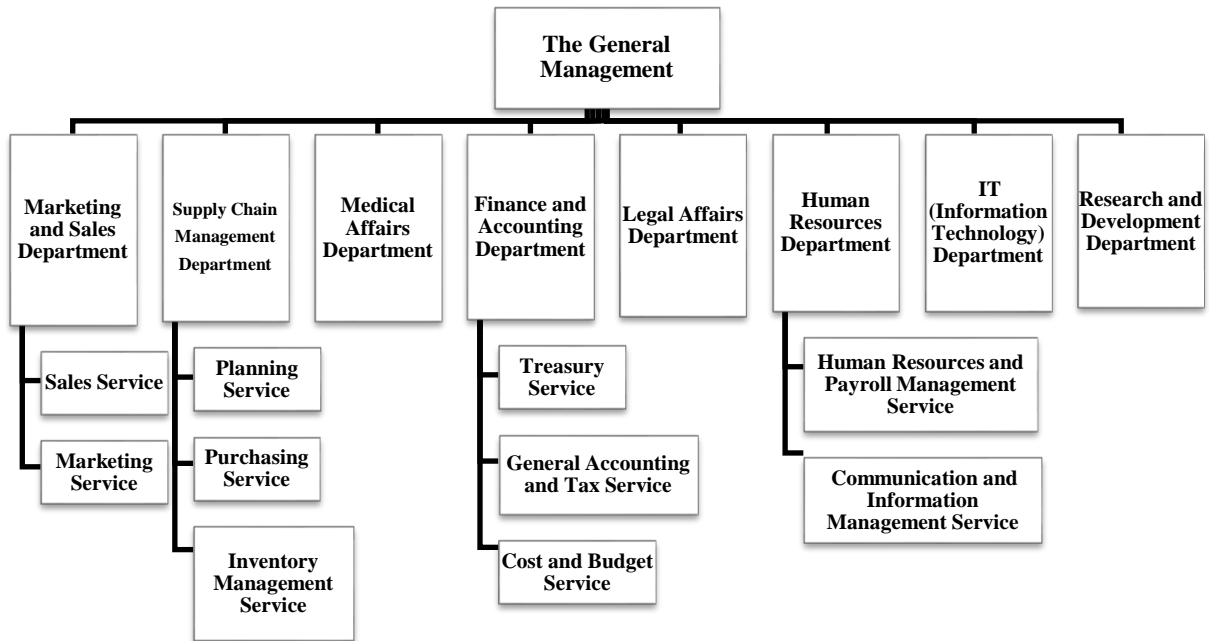
As for retail pharmacies, they usually source their supplies from wholesale distributors. These wholesale distributors purchase medications in bulk from pharmaceutical companies and then distribute them to pharmacies.

In summary, the distribution network for medications at Hikma Pharma Algeria may vary depending on the type of client, with different supply procedures for hospitals and clinics compared to retail pharmacies.

D. The departments of Hikma Pharma Algeria (HPA)

We have reviewed the organizational chart provided by the company (see Appendix No.1) that describes the responsibilities of each department

Figure N°12: schematic representation of the functional, organizational and hierarchical links of HIKMA PHARMA



Source: Source: Created by the authors

D.1. Organizational Chart Analysis:

D.1.1 Human Resources Department: It consists of the following services:

- **Personnel and Payroll Management Service:** This service is responsible for:
 - Recruitment and dismissal of employees
 - Preparation of pay slips and employment contracts
 - Monitoring of personnel: leaves, illnesses, absences
 - Maintenance of order and control, and timekeeping tasks
 - Preparation of commissions and meetings

- Submission of declarations to relevant organizations (social security)
- Participation in exchanges with employee unions
- Study of career and salary advancement opportunities for employees
- Assessment of personnel needs and possible training programs
- **Communication and Information Management Service:** The tasks of this service include:
 - Defining outward-oriented publications and designing messages
 - Managing communication channels: company journal, posters, audio-visual materials, regular meetings.

D.1.2 Financial Management Department: This department consists of three services:

- **Treasury Service:** This service is responsible for:
 - Supervising and monitoring the company's daily cash positions
 - Forecasting cash flow
 - Reconciling with the actual recorded by the accounting department, including overseeing the collection process
 - Actively participating in the development of the company's financial strategies (short, medium, and long-term financing, capital raising, portfolio yield optimization, etc.)
 - Monitoring and ensuring compliance with key financial ratios of the company (debt, solvency, working capital, cash flow generation)
 - Managing all relationships with banking partners (negotiating terms, selecting partners, increasing integration of IT relationships, monitoring, etc.)
- **General Accounting & Tax Service:** The role of this service includes:
 - Recording accounting transactions
 - Controlling the registration of all transactions in the accounting books

- Verifying the maintenance of all legally required registers, accounting, financial, and tax documents
- Responding to tax-related forms within the required deadlines
- Determining monthly and annual balances before and after inventories
- Preparing the balance sheet for each accounting period within the required deadlines
- Assisting with accounting audits and ensuring the resolution of any issues
- Preparing tax declarations
- Ensuring timely settlement of tax and parafiscal obligations
- Ensuring the maintenance and improvement of the quality system
- Actively participating in the implementation of the quality management system.

➤ **Cost & Budget Service:** The Cost service is responsible for:

- Reconciling each product with its costs, whether incurred in the current period or in previous periods
- Division of results by decision centers to enable better management or consolidation by line of activity for better assessment
- Monitoring activities and controlling the budget (avoiding deficits and surpluses)
- Proactively managing and anticipating deviations
- Establishing control processes as a useful, acceptable, and understandable practice for all
- Taking corrective actions such as adjusting the budget within constraints (spending less or more) and/or adjusting activities (doing less or more)
- Optimizing resource utilization.

D.1.3 Legal Affairs Department: Its mission includes:

- Drafting and monitoring registration documents
- Providing advice and assistance on regulatory aspects to relevant departments (development, production, sales, marketing, quality)
- Drafting procedures related to regulatory activities
- International regulatory monitoring

- Controlling promotional documents for both pharmaceuticals and medical devices.

D.1.4 Research and Development Department:

- Defining the innovation strategy in accordance with the general management and market needs.
- Organizing scientific and technical monitoring and conducting competitive positioning studies.
- Supervising the progress of the company's R&D projects.
- Managing resources dedicated to projects.
- Evaluating team performance, facilitating knowledge sharing, and providing guidance on encountered issues.

D.1.5 Medical Affairs Department: This department is responsible for:

- Managing medical training for medical representatives.
- Overseeing the scientific aspects of the product.
- Validating presentations and communications for conferences and symposiums.

D.1.6 Sales and Marketing Department:

Responsible for developing sales and marketing plans, conducting market research, pricing, promotion/advertising, distribution, communication, etc.

Also involved in formulating marketing strategies based on studies of medical advancements and established development plans.

This function has the closest interaction with consumers. The sales and marketing function of Hikma encompasses all activities and processes that enable the company to understand consumer expectations and the market landscape in which it operates. It strives to influence consumer behavior in line with its objectives.

D.1.7 IT (Information Technology) Department:

Also referred to as the IT department or the organization's IT division. IT operations encompass administrative processes and provide hardware and software support to both internal and external clients.

D.1.8 Supply Chain Management Department:

This is the department where we completed our internship, and it is the department we will discuss in the following section.

D.1.8.1 Presentation of the welcoming department:

The Supply Chain Management department of Hikma Pharma Algeria is divided into several sub-departments, each with specific missions related to the management of the company's pharmaceutical supply chain and distribution in Algeria. This department is responsible for the planning, coordination, and execution of all activities related to the supply chain, from production to delivery to customers.

The main functions of Hikma Pharma Algeria's Supply Chain Management department include inventory management, production planning, order and procurement management, coordination of logistics operations, transportation management, and supplier and customer relationship management.

- The Planning sub-department: This sub-department is responsible for planning the production of the company's pharmaceutical products. It manages demand forecasting, production planning, optimization of production capacities, coordination with other sub-departments to ensure production deadlines are met, and resolution of issues related to production delays.
- The Procurement sub-department: This sub-department is responsible for managing the procurement of raw materials, equipment, and supplies necessary for the production of the

company's pharmaceutical products. It handles supplier selection, negotiation of purchase contracts, order placement, supply management, verification of product quality upon receipt, and management of returns.

- The Inventory Management sub-department: This sub-department is responsible for managing the inventory of finished products and raw materials within the company. It defines optimal stock levels, manages stock movements, prevents stockouts, handles obsolescence, verifies product condition, and manages stock reports.

Regarding the relationship of the Supply Chain Management department with other departments in the company, it is important to note that supply chain management is a cross-functional function that requires close coordination with other departments. For example, the Supply Chain Management department works closely with the production department to ensure production levels align with demand, with the sales department to ensure timely processing of customer orders, and with the quality department to ensure delivered products meet quality standards.

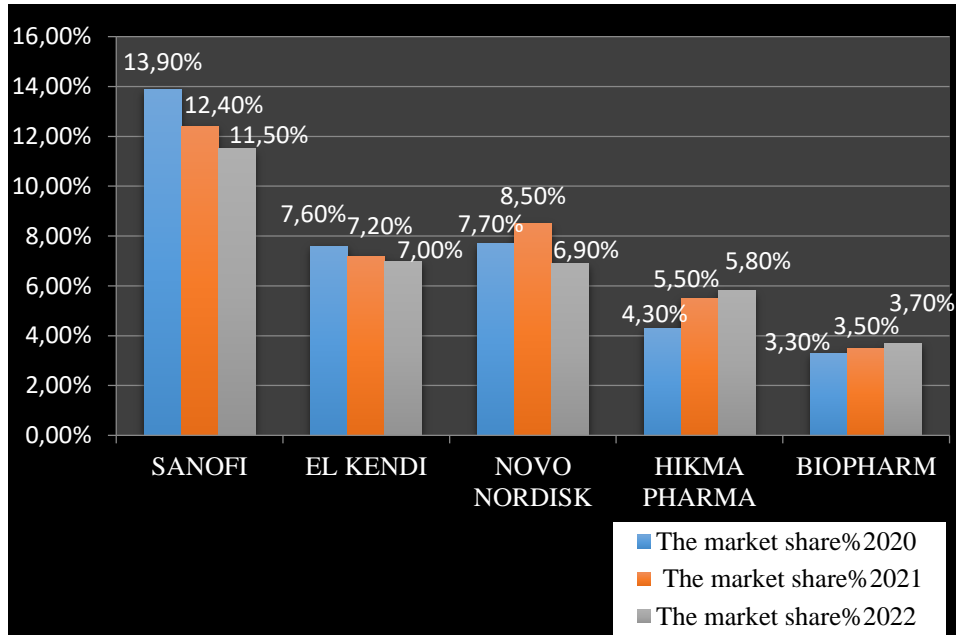
In summary, the Supply Chain Management department at Hikma Pharma Algeria plays a crucial role in coordinating the company's activities to ensure optimal supply chain efficiency and maximum customer satisfaction.

D.1.8.2 The company's positioning in relation to its environment

D.1.8.2.a The company facing competition

In an ever-changing market characterized by intense competitiveness and increased economic intelligence, the Hikma Group has managed to position itself by adopting a continuous improvement approach and conforming to new international standards. This has allowed the company to rank among the top five laboratories in the Algerian market. The figure below presents the evolution of market shares for the five major laboratories in Algeria between 2020 and 2022.

Diagram N°01: Evolution of market shares of the Top 5 laboratories in Algeria



Source: Source: Created by the authors depending on real data

Commentary:

The provided data illustrates the market share evolution of the top 5 laboratories in Algeria from 2020 to 2022. In this analysis, we will focus on Hikma Pharma, which is our company.

In 2020, Hikma Pharma held a market share of 4.30%, placing it among the top laboratories in Algeria. However, over the course of the following year, Hikma Pharma experienced notable growth, with its market share increasing to 5.50% in 2021. This expansion demonstrates the company's successful strategies and efforts to capture a larger portion of the market.

Continuing the positive trend, Hikma Pharma further improved its position in 2022, with its market share reaching 5.80%. This growth indicates Hikma Pharma's ability to effectively compete and gain market traction in the pharmaceutical industry in Algeria.

It is worth noting the performance of other companies in the market as well. Sanofi, which held the highest market share in 2020 with 13.90%, experienced a decline to 12.40% in 2021 and

further decreased to 11.50% in 2022. EL KENDI and NOVO NORDISK also witnessed a slight reduction in their market shares, while BIOPHARM showed a modest increase from 3.30% in 2020 to 3.70% in 2022.

Overall, the market share data highlights Hikma Pharma's progressive growth and rising prominence within the Algerian pharmaceutical market. The company's commitment to continuous improvement and adherence to international standards have enabled it to successfully compete and strengthen its position against established competitors.

D.1.8.2.b The rank of the company

Table N°02: Representation of the 5 companies rank

	Rank 2020 in UV	Rank 2021 in UV	Rank 2022 in UV
SANOFI	1	1	1
EL KENDI	3	3	2
NOVO NORDISK	2	2	3
HIKMA PHARMA	4	4	4
BIOPHARM	5	5	5

Source: Created by the authors

Commentary:

The table presents the rankings of pharmaceutical companies based on unit volume (UV) for the years 2020, 2021, and 2022. Focusing on Hikma Pharma, our company, it consistently held the fourth position in the rankings throughout the three-year period.

In 2020, Hikma Pharma started at the fourth rank, indicating its established presence in the market. This position demonstrated its ability to compete with other pharmaceutical companies in terms of unit volume.

Moving to 2021, Hikma Pharma maintained its fourth rank, showcasing its ability to sustain its market position. Despite any fluctuations in the industry, the company's performance remained steady and consistent.

As we progress to 2022, Hikma Pharma continued to hold the fourth rank. This indicates its ability to maintain its market share and compete effectively with other companies in terms of unit volume.

While Hikma Pharma's rank remained unchanged over the three years, it is important to consider the context of the market and the overall performance of the company. Holding a consistent position suggests stability and resilience in the face of competition.

In conclusion, Hikma Pharma demonstrated its ability to maintain a strong market presence, consistently holding the fourth rank in terms of unit volume from 2020 to 2022. This stability provides a solid foundation for the company to further strategize and explore opportunities for growth in the competitive pharmaceutical industry.

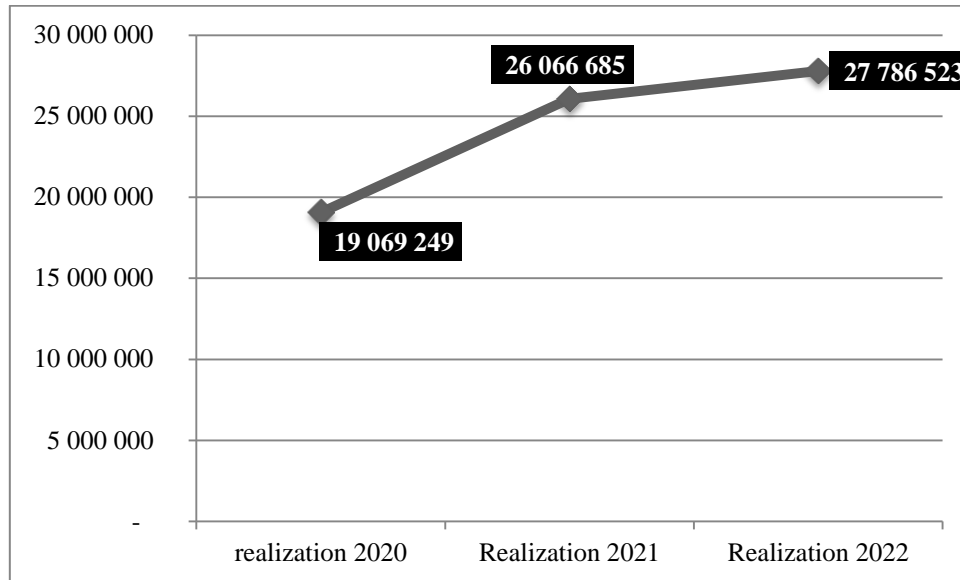
D.1.8.2.c The evolution of the company's turnover/revenue

Table N°03: the different evolution of realizations and objectives in 2021 and 2022

objective 2021	Realization rate 2021	objective 2022	Realization rate 2022
23 500 000	110,90%	26 500 000	105%

Source: Created by the authors

Diagram N°02: The evolution of business achievements



Source: Created by the authors

Commentary:

The table above presents the financial data related to Hikma Pharma for the specified years.

Starting with the year 2020, Hikma Pharma achieved a realization of 19,069,249 units, representing the actual revenue or sales generated during that period.

Moving on to the objective for 2021, Hikma Pharma set a target of 23,500,000 units. However, the company exceeded expectations, achieving a realization of 26,066,685 units. This resulted in a realization rate of 110.90%, indicating that Hikma Pharma surpassed its objective for 2021.

Looking ahead to the objective for 2022, Hikma Pharma aims to achieve 26,500,000 units in sales. As for the realization in 2022, Hikma Pharma achieved a total of 27,786,523 units, resulting in a realization rate of 105%. This signifies that the company successfully met its objective for 2022.

The consistent overachievement of objectives and positive realization rates demonstrate Hikma Pharma's strong performance and ability to surpass targets, indicating its effective business strategies and market competitiveness.

Overall, these figures reflect Hikma Pharma's continuous growth and success in generating revenue, positioning the company as a prominent player in the pharmaceutical industry.

Section 2: Presentation of the research methodology of the study

As part of our research conducted at Hikma Pharma Algeria, we have chosen to adopt two different research approaches: qualitative study and quantitative study.

A. The qualitative study

In this study, we used the qualitative research method, it is a direct method used to gather information and understand perspectives from interview guides and document collections. We conducted interviews using a general guide to reference the main themes to be addressed and the questions to ask the actors. The interviews were conducted in a semi-directive manner, and external documents were evaluated: websites, brochures, internal documents, activity reports, organizational charts to provide a complete and reliable source of information.

A.1. Presentation of the Interview guide

As part of our research focused on investigating the impact of MRP on enhancing business performance, we have developed a comprehensive semi-structured interview guide. This guide is divided into four distinct sections and encompasses a total of 15 thought-provoking questions:

- Identification of the interviewer and the company
- Explanation of the raw material and production order management process
- Indication of the reasons for the use of MRP within the company
- Indication of the difficulties encountered during the implementation of the MRP

- Indication of the benefits observed following the application of the MRP
- Identification of the impact of MRP in improving the efficiency and speed of the raw material order management process
- Identification of the impact of MRP in improving production planning and reducing production costs
- Identification of the impact of MRP in minimizing the risk of stock shortages and optimizing its levels
- Identification of the impact of MRP in improving the competitiveness of the company
- Determination of the difference between MRP and other planning tools such as Kanban or Just in time
- Overall assessment of the impact of the application of MRP on the commercial performance of the company
- Identification of future developments planned to continue to optimize the use of MRP software to improve business performance

Table N°04: The different sections and objectives of the guide interview

	Sections	Objectives
Section 01	Introduction of the interviewer and the company	<ul style="list-style-type: none"> - Introduce the interviewer and establish a connection with the interviewee. - Set the context for the interview and provide a brief overview of what will be discussed.
Section 02	MRP Implementation and Benefits	<ul style="list-style-type: none"> - Understand the company's current raw material and production order management process. Explore the reasons behind the adoption of MRP within the company. - Identify any challenges faced during the implementation of MRP. - Discuss the observed benefits after implementing MRP, particularly in terms of efficiency, speed, production

		planning, and stock management.
Section 03	Comparison with Other Planning Tools	<ul style="list-style-type: none"> - Differentiate MRP from other planning tools such as Kanban or Just in Time. Highlight the unique advantages and disadvantages of using MRP in the company's context. - Explore the specific reasons why MRP was chosen over other planning tools.
Section 04	Future Developments and Conclusion	<p>Assess the overall impact of implementing MRP on the company's commercial performance.</p> <p>Identify any future plans or developments to further optimize the use of MRP software and enhance business performance.</p>

Source: Created by the authors

A.2. Interview profiles

We have gained access to two perspectives within the organization's planning and supply chain functions, providing a comprehensive view of the role of MRP in enhancing commercial performance.

Wassila Taghlit - Planning Manager:

Wassila Taghlit is a highly experienced Planning Manager with a strong background in strategic planning and operational management. With her extensive knowledge and expertise in supply

chain management, she plays a crucial role in overseeing and optimizing the planning processes within the organization. Wassila's dedication to continuous improvement and her ability to handle complex planning challenges make her an invaluable asset in enhancing overall business performance

Wassila Taghlit was chosen for the interview due to her role as a Planning Manager. Her expertise in planning and her familiarity with the implementation of MRP in the organization make her an ideal candidate to provide insights into the role of MRP in improving commercial performance.

Ségmane Anis - Supply Planning Officer:

Ségmane Anis is a dedicated Supply Planning Officer with a strong focus on optimizing supply chain operations. With a deep understanding of demand forecasting, inventory management, and order fulfillment, Ségmane ensures that the company's supply needs are met in a timely and efficient manner.

Ségmane Anis was chosen for the interview as a Supply Planning Officer because of his direct involvement in the implementation and utilization of MRP within the company. As a key player in supply chain operations, Ségmane possesses valuable insights into the impact of MRP on raw material order management, production planning, stock optimization, and overall commercial performance.

A.3. The interview guide

And here is the interview guide and the responses of every question with the analyses:

1. Question: Can you tell us about your company and your role within it?

- **Response 1:** *“I am Wassila taghlit responsible of planification and raw material management in Hikma Pharma Algeria. Hikma Pharma Algeria specializes in the manufacturing of pharmaceutical products. We produce different types of products such as UNISIA, PROSPANE, and NOPAIN”.*

- **Response 2:** *“I am Ségmane Anis an employee of Hikma Pharma Algeria, I work in the planification department and my role is supplying planning officer. Our company, Hikma Pharma Algeria, is renowned for its steadfast commitment to manufacturing high-quality medicines and ensuring accessibility for those in need”.*

Analysis: The responses indicate that Hikma Pharma Algeria specializes in the manufacturing of pharmaceutical products such as UNISIA, PROSPANE, and NOPAINE. The respondents hold positions related to planning, raw material management, and procurement.

2. Question: Can you briefly explain the current raw material and production order management process in your company?

- **Response1:** Currently, our process for managing raw material orders and production involves collecting raw material requirements from different departments, creating purchase orders, coordinating with suppliers, receiving raw materials, monitoring production, and shipping finished products. However, this process is often manual and requires close coordination among different departments, which can lead to delays and errors.
- **Response2:** In our company, the current process for managing raw material orders and production involves several key steps. Firstly, we assess the demand for our products and generate production plans accordingly. Next, we initiate the procurement of raw materials to meet the production requirements. Once the materials are received, we undertake the manufacturing process, adhering to strict quality control measures. Finally, the finished products are inspected, packaged, and prepared for distribution to fulfil customer orders.

Analysis: The responses indicate that the current process for managing raw materials and production orders involves collecting raw material requirements, creating purchase orders, coordinating with suppliers, receiving raw materials, monitoring production, and shipping finished products. However, this process may be manual and present challenges in coordinating between different departments, leading to delays and errors.

3. Question: Why did you choose to use MRP in your business? What were the objectives pursued?

- **Response1:** We chose to use MRP in our company to improve our order and production management process. Our main objectives were to optimize inventory levels, reduce delivery delays, improve operational efficiency, and ensure effective coordination among the different departments involved in raw material management.
- **Response2:** The implementation of MRP in our company was driven by several factors. Firstly, we aimed to streamline our inventory management and optimize the allocation of resources. MRP allows us to forecast demand, plan production schedules, and ensure sufficient availability of raw materials. By adopting MRP, we sought to enhance operational efficiency, reduce lead times, and minimize stockouts, ultimately improving customer satisfaction and overall performance.

Analysis: The responses indicate that the company chose to use MRP to improve order and production management. The objectives pursued were optimizing inventory levels, reducing delivery delays, improving operational efficiency, and ensuring effective coordination among different departments involved in raw material management.

4. Question: What are the main difficulties you encountered when implementing MRP?

- **Response1:** During the implementation of MRP, we encountered challenges such as gathering and managing initial data, integrating the MRP software with our existing systems, as well as training and adapting employees to the new tool. However, through careful planning, clear communication, and adequate training, we successfully overcame these difficulties.
- **Response2:** While implementing MRP, we faced certain challenges. One significant obstacle was ensuring accurate data input to achieve reliable demand forecasts. Additionally, aligning our existing processes and systems with the MRP framework required careful coordination and extensive training for our employees. Overcoming these

challenges required a collaborative effort, involving cross-functional teams and continuous improvement initiatives.

Analysis: The responses mention difficulties such as collecting and managing initial data, integrating the MRP software with existing systems, as well as training and adapting employees to the tool. However, these difficulties were overcome through careful planning, clear communication, and adequate training.

5. Question: What are the main benefits you have seen from applying MRP in your business?

- **Response1:** Following the implementation of MRP, we have observed several significant advantages. Firstly, we have been able to optimize our inventory levels by avoiding excess and shortages, which has reduced inventory costs and improved our cash flow. Additionally, we have improved the accuracy of our demand forecasts, enabling better production planning and reduced delivery lead times.
- **Response2:** Since the implementation of MRP, we have experienced several noteworthy benefits. Firstly, our inventory management has become more efficient, reducing excess stock and optimizing levels to meet demand. The visibility provided by MRP enables better planning, resulting in improved production schedules and reduced lead times. Furthermore, the accuracy of demand forecasting has increased, allowing us to meet customer needs more effectively and minimize stockouts.

Analysis: The responses highlight several significant benefits of applying MRP, such as optimizing inventory levels, reducing inventory costs, improving demand forecasting accuracy, and reducing delivery lead times.

6. Question: How has MRP helped improve the efficiency and speed of your raw material order management process?

- **Response 1:** MRP has significantly enhanced the efficiency and speed of our raw material order management process. By automating tasks such as generating procurement

recommendations, creating purchase orders, and coordinating with suppliers, we have reduced order processing times and improved the responsiveness of our supply chain.

- **Response 2:** MRP has played a pivotal role in improving the efficiency and speed of our raw material order management process. By automating and streamlining the process, MRP provides real-time visibility into inventory levels and demand. This enables us to place timely orders for raw materials, minimizing delays and ensuring a continuous supply. The systematic approach offered by MRP allows us to optimize resource utilization and reduce the time required for material procurement.

Analysis: Both responses highlight the significant improvement in efficiency and speed of the raw material order management process due to MRP. Overall, MRP has positively impacted the efficiency and speed of raw material order management.

7. Question: How has MRP helped to improve production planning in your company and reduce production costs?

- **Response 1:** Through the application of MRP, we have improved production planning by aligning demand with available production capacity. This has enabled us to reduce production costs by avoiding unnecessary overcapacity or undercapacity. Furthermore, better coordination between production departments and suppliers has helped us optimize resource utilization and reduce production-related costs.
- **Response 2:** The implementation of MRP has significantly enhanced production planning in our company. Through accurate demand forecasting, MRP enables us to align production schedules with customer requirements, optimizing resource allocation and reducing idle time. This streamlined planning process reduces production costs by minimizing wastage, improving overall productivity, and avoiding unnecessary inventory build-up.

Analysis: responses discuss how MRP has improved production planning and reduced production costs.

MRP has played a crucial role in improving production planning and cost reduction.

8. Question: How has the application of MRP helped minimize the risk of stockouts and optimize stock levels for a business?

- **Response 1:** The application of MRP has played a crucial role in minimizing stockouts and optimizing inventory levels for our company. Through precise planning based on demand forecasts and delivery lead times, we have been able to maintain appropriate stock levels to meet customer demand while avoiding excesses that could result in additional costs.
- **Response 2:** MRP has been instrumental in minimizing stockouts and optimizing inventory levels within our company. By precisely calculating the required inventory levels based on demand forecasts, MRP ensures that we maintain sufficient stock to fulfil customer orders without excessive inventory build-up. This systematic approach to inventory management minimizes the risk of stockouts, improves order fulfilment rates, and reduces carrying costs associated with excess inventory.

Analysis: According to the responses we find that the application of MRP has played a crucial role in minimizing stockouts and optimizing inventory levels for the company. By precisely planning based on demand forecasts and delivery lead times, they have been able to maintain appropriate stock levels to meet customer demand while avoiding excesses that could result in additional costs.

9. Question: How has the application of MRP helped to improve your company's competitiveness in the market?

- **Response 1:** The application of MRP has contributed to improving the competitiveness of our company in the market in several ways. We are able to respond more quickly to customer demands through better planning and shorter delivery lead times. Additionally, by optimizing our inventory levels and reducing production costs, we have been able to offer competitive pricing to our customers, strengthening our market position.

- **Response 2:** The application of MRP has played a vital role in improving our company's competitiveness in the market. By streamlining our production processes, optimizing inventory levels, and ensuring timely order fulfilment, we can meet customer demands effectively and efficiently. This enhanced operational performance allows us to respond swiftly to market changes, provide reliable supply to our customers, and maintain a competitive edge in the industry.

Analysis: MRP has contributed improving the competitiveness of the company in the market. They are able to respond more quickly to customer demands through better planning and shorter delivery lead times. Additionally, by optimizing inventory levels and reducing production costs, they have been able to offer competitive pricing to their customers, strengthening their market position.

10. Question: Can you present the following products to us: UNISIA, PROSPAN, NOPAIN?

- **Response 1:** Hikma Pharma Algeria offers a range of high-quality products, including Prospan Cough Syrup, which is an alcohol and sugar-free cough syrup made with dry ivy leaf extract, acting as a mucolytic and spasmolytic agent. Nopain A Tablet is another product, providing relief from pain and inflammation associated with conditions like rheumatoid arthritis, ankylosing spondylitis, and osteoarthritis. It also helps alleviate fever, muscle pain, back pain, toothache, and pain in the ear and throat. Lastly, Unisia is a combination product containing Candesartan Cilexetil 8 mg and amlodipine 5 mg. When using Unisia, it is important to consider the potential adverse reactions of both components and administer it appropriately.
- **Response 2:** Within our product portfolio at Hikma Pharma Algeria, we proudly offer the following products: Prospan Cough Syrup, a cough syrup made from dry ivy leaf extract that acts as a mucolytic and spasmolytic agent. It is notable for being alcohol and sugar-free. Nopain A Tablet is a combination medicine that effectively relieves pain and inflammation associated with various conditions such as rheumatoid arthritis, ankylosing spondylitis, and osteoarthritis. It is also beneficial in alleviating fever, muscle pain, back

pain, toothache, as well as pain in the ear and throat. Lastly, we have Unisia, a combination product consisting of Candesartan Cilexetil 8 mg and amlodipine 5 mg. While considering the potential adverse reactions of both components, it is essential to ensure appropriate evaluation and administration of Unisia.

Analysis: Hikma Pharma Algeria offers a range of high-quality products including Prospan, Nopain and Unisia

11. Question: How has the MRP improved the efficiency of upstream logistics operations for UNISIA, PROSPAN, NOPAIN?

- **Response 1:** MRP has improved the efficiency of upstream logistics operations for UNISIA, PROSPAN, and NOPAIN by providing increased visibility into raw material requirements, facilitating coordination with suppliers, and optimizing delivery lead times. This has helped prevent production delays and reduce costs associated with inventory and logistics.
- **Response 2:** The implementation of MRP has significantly improved the efficiency of upstream logistics operations for our products, including UNISIA, PROSPAN, and NOPAIN. MRP enables accurate demand forecasting, allowing us to plan and coordinate the procurement of raw materials required for production. This streamlined process minimizes delays in the supply chain, enhances inventory management, and ensures the availability of materials needed for timely manufacturing and distribution of these products.

Analysis: MRP has enhanced the efficiency of upstream logistics operations for UNISIA, PROSPAN, and NOPAIN by providing better visibility into raw material requirements, enabling coordination with suppliers, and optimizing delivery lead times. This results in smoother supply chain operations, reduced production delays, and cost savings associated with inventory and logistics.

12. Question: How does your company use MRP data to forecast demand and plan production for each of the three products?

- **Response 1:** Our Company utilizes MRP data to forecast demand and plan production for each of the three products. We analyze historical data, market trends, demand forecasts, and production capabilities to determine production quantities, timelines, and raw material requirements. This information helps us optimize our production and effectively respond to market demand.
- **Response 2:** In our company, we utilize MRP data to forecast demand and plan production for UNISIA, PROSPAN, and NOPAIN. By analysing historical sales data, market trends, and customer requirements, we input relevant information into the MRP system. This enables us to generate accurate demand forecasts and establish production schedules aligned with customer needs. MRP data serves as a valuable tool for inventory planning, ensuring we have the necessary materials to fulfil production requirements for each product.

Analysis: According to the responses before, MRP data is used to forecast demand and plan production for UNISIA, PROSPAN, and NOPAIN. Historical data, market trends, and customer requirements are analysed to generate accurate demand forecasts and establish production schedules. This allows the company to optimize production, effectively respond to market demand, and ensure sufficient inventory levels.

13. Question: How does MRP compare to other production planning tools such as Kanban or Just-In-Time (JIT)?

- **Response 1:** MRP differs from other production planning tools such as Kanban or Just-In-Time (JIT) in its ability to handle complex information and consider multiple variables such as demand forecasts, delivery lead times, and inventory levels. MRP offers a more comprehensive and automated approach to production planning, enabling better synchronization of the supply chain and cost reduction.

- **Response 2:** MRP, Kanban, and JIT are distinct production planning tools, each with its own advantages and applications. MRP is a comprehensive system that integrates various aspects of production planning, inventory management, and demand forecasting. It is particularly suited for complex manufacturing environments with diverse product lines and extensive material requirements. Kanban and JIT, on the other hand, are more focused on just-in-time inventory replenishment and lean manufacturing principles, emphasizing efficient flow and minimal waste. The choice between these tools depends on the specific needs and characteristics of the production environment.

Analysis: MRP stands out from other production planning tools like Kanban or JIT due to its ability to handle complex information and consider multiple variables. MRP offers a comprehensive and automated approach to production planning, which enables better synchronization of the supply chain and cost reduction. However, Kanban and JIT have their own advantages and are suitable for specific production environments that prioritize just-in-time inventory replenishment and lean manufacturing principles.

14. Question: How would you rate the overall impact of the application of MRP on the commercial performance of your company?

- **Response 1:** Overall, the application of MRP has had a significant impact on the business performance of our company. We have witnessed improvements in operational efficiency, reduced inventory costs, enhanced customer satisfaction through shorter delivery lead times, and improved coordination among departments. These improvements have strengthened our competitiveness in the market.
- **Response 2:** The implementation of MRP has had a significant positive impact on the business performance of our company. It has improved operational efficiency, reduced lead times, and enhanced our ability to meet customer demands accurately. The streamlined inventory management and production planning processes have resulted in cost savings, improved resource utilization, and increased customer satisfaction. Overall,

MRP has played a crucial role in elevating our company's performance and competitiveness in the market.

Analysis: Both responses highlight the overall positive impact of MRP on the business performance of the company. The application of MRP has led to improvements in operational efficiency, reduced costs, enhanced customer satisfaction through shorter delivery lead times, and improved coordination among departments. These improvements have strengthened the company's competitiveness in the market.

15. Question: What are the future developments planned to continue to optimize the use of MRP software in order to improve the performance of your company?

- **Response 1:** To further optimize the use of MRP software and improve the performance of our company, we plan to implement complementary modules such as demand forecasting and production scheduling algorithms, real-time data integration with suppliers, and advanced analytics for better decision-making in raw material management and production planning.
- **Response 2:** To continuously optimize the utilization of the MRP software and further improve our company's performance, we have several future developments planned. These include leveraging advanced analytics and data-driven insights to enhance demand forecasting accuracy, we will continue investing in employee training and development to ensure maximum utilization of the MRP software and stay at the forefront of industry best practices.

Analysis: responses outline future developments planned to optimize the use of MRP software and improve the company's performance. These developments include implementing complementary modules such as demand forecasting and production scheduling algorithms, real-time data integration with suppliers, and advanced analytics. Additionally, there is a focus on leveraging advanced analytics and investing in employee training and development to ensure maximum utilization of the MRP software and stay updated with industry best practices.

A.4. General Analysis

Based on the provided responses of the interview guide, the application of Material Requirements Planning (MRP) in the company, Hikma Pharma Algeria, has had several positive impacts on its operations and commercial performance. Here is a general analysis of the overall impact of MRP:

Improved Order and Production Management: The implementation of MRP has helped streamline the company's raw material and production order management processes. By automating tasks, coordinating with suppliers, and monitoring production, MRP has improved efficiency, reduced delays, and minimized errors in the overall process.

Optimization of Inventory Levels: MRP has played a crucial role in optimizing inventory levels for the company. Through accurate demand forecasting, it ensures that the company maintains appropriate stock levels to meet customer demand while avoiding excess inventory and associated costs.

Enhanced Production Planning: MRP has significantly improved production planning in the company. By aligning demand with production capacity and facilitating better coordination between production departments and suppliers, MRP helps optimize resource utilization and reduces production-related costs.

Minimization of Stockouts: MRP has helped minimize the risk of stockouts by providing better visibility into raw material requirements, facilitating timely procurement, and ensuring a continuous supply of materials. This has improved order fulfilment rates and reduced carrying costs associated with excess inventory.

Improved Competitiveness: The application of MRP has contributed to improving the company's competitiveness in the market. By responding quickly to customer demands, optimizing inventory levels, reducing production costs, and offering competitive pricing, the company has strengthened its market position.

Enhanced Efficiency in Logistics Operations: MRP has improved the efficiency of upstream logistics operations by providing increased visibility into raw material requirements, facilitating coordination with suppliers, and optimizing delivery lead times. This has helped prevent production delays and reduce costs associated with inventory and logistics.

Overall, the application of MRP has brought significant benefits to the company, including improved operational efficiency, optimized inventory levels, enhanced production planning, minimized stockouts, increased competitiveness, and improved logistics operations. These improvements have positively impacted the company's commercial performance, allowing it to meet customer demands effectively, reduce costs, and maintain a strong market position.

B. The quantitative study:

The second method employed in this study is the quantitative approach, which serves as a standardized methodology for evaluating, calculating, and comprehending research outcomes. This rigorous method enables a systematic analysis of data, providing precise measurements and statistical insights that contribute to a deeper understanding of the research findings. By employing the quantitative method, the study aims to establish a robust foundation for drawing meaningful conclusions and making evidence-based recommendations.

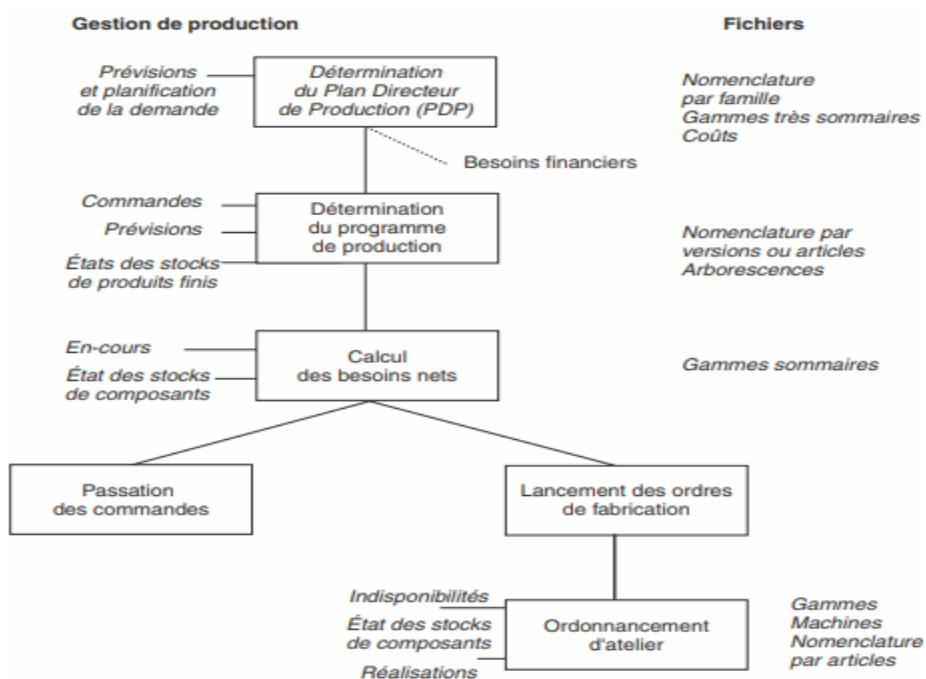
B.1. Application of MRP

The utilization of MRP software in production management has revolutionized the way businesses analyze and utilize data related to inventory, demand forecasts, production times, and delivery times. To effectively implement MRP software, a series of specific steps need to be followed. The process begins with the development of an industrial and commercial plan (PIC), which outlines the overall production requirements over a long-term horizon. Subsequently, a production master plan (PDP) is established to identify the net requirements for each finished product within a shorter timeframe. Once this stage is completed, net requirements are calculated, and component requirements are planned based on the PDP, operating ranges, and nomenclatures. Following the determination of component needs, supply orders (OA) and

manufacturing orders (OF) are meticulously planned, taking into account factors such as timing and quantity. This comprehensive approach to MRP implementation ensures efficient production planning and resource allocation, ultimately enhancing overall operational performance.

This method of analysis is inspired by: the stages of MRP ⁶⁹.

Figure N°13 : Les étapes de la planification de la production



**Source : PIMOR (Y), FENDER (M) « logistique : production distribution soutien » 5 -ème édition
DUNOD, 2008, p362.**

⁶⁹ <https://foad-mooc.auf.org/IMG/ppt/MRP.ppt> consulted on 15 March at 13 :58

B.2. The industrial and commercial plan:

The PIC is the generator of the implementation of the formalized MRP planning system and aims to allocate capacity according to the priorities set by the general management and to check that it corresponds to the available capacity. The resulting industrial plan is used to establish monthly delivery targets over a defined horizon, cash and inventory forecasts as well as purchasing, labor and equipment budgets. It also allows setting the limits of the PDP.⁷⁰

The industrial and commercial plan table is a tool used to plan and monitor the production of a company, Object of the PIC procedure:⁷¹

- Define a production / sales plan

PIC (in French), MSP (Manufacturing & Sales Plan) or S&Op (Sales & Operations Plan) in English

- To minimize total cost or maximize margin
- By respecting the constraints
 1. Commercial (mandatory availability dates)
 2. Techniques (supply, production, storage, transport)
 3. Financial (debt capacity, campaign credit)
 4. Human (staff availability, supervision)
- The CIP is often the entry point for the budget.
- Used to assess working capital requirements.
- Also used for long-term supplies and for reserving capacity with suppliers (contracts, open orders).

⁷⁰ Philippe Benollet, Joël Khébian Pro en Achats (2019), pages 74

⁷¹ <https://www.e-prelude.com/Site/FR/PresentationsMIL/PIC.pdf> consulté le 19 Mars à 08 :55

The establishment of an Industrial and Commercial Plan (PIC) involves the formalization of the procedures for establishing and managing the Production Master Plan (PDP). This process forces the different departments of the company to work together to establish common rules and compromises.

It is important to designate the permanent participants such as the general management, the plant manager, the sales, purchasing, logistics, management control and human resources teams. It is also necessary to prioritize the families or groups of production products to be monitored, taking into account sales and production histories to set stock targets by product family.

Table N°05: Example of PIC

	Initial	Période 01	Période 02	Période 03	Période 04	Période 05
Demande		X_1	X_2	X_3	X_4	X_5
Production						
Stock au début	Stock 0					
Stock de fin						
Employés	N					
Recrutement						
Licenciement						

Source : GRATACAP (A) et MEDAN (P)

B.2.1 The production master plan:

A PDP (Production Master Plan), also called Manufacturing Planning and Scheduling (MPS) in English, is an essential step in production planning. It makes it possible to precisely indicate planned production, management objectives and stock levels.⁷²

⁷² <https://open-prod.com/lexique/pdp-definition/> consulté le 19 Mars à 09 :20

Its purpose is to define, this time by product, the quantities to be manufactured for the coming months. Here again, it is from a forecast of future demand that this plan is drawn up. The general planning framework having been set by LePIC, the PDP is more particularly set up² by the commercial and technical departments, the periodicity being weekly in many cases.⁷³

It may also include contingency plans to deal with unforeseen situations. The PDP is an essential tool for companies looking to improve their operational efficiency and maximize their long-term profits.

The key objectives of the Production Master Plan (PDP) are

- Plan production resources: The PDP helps companies plan and allocate production resources, such as machines, raw materials, workers, etc. to meet long-term production goals.
- Maximize production efficiency: PDP helps companies identify bottlenecks and inefficiencies in their production process and develop plans to address them.
- Improve customer satisfaction: PDP helps businesses meet customer needs for products and services by ensuring adequate production to meet demand.
- Reduce costs and increase profitability: The PDP helps companies assess production costs and develop strategies to reduce them, which can increase the company's profitability.
- Establish long-term planning: PDP helps companies plan for the long term, which can reduce uncertainty and facilitate decision-making.

B.2.2 The components of an industrial and commercial plan

The Components of an Industrial and Commercial Plan Table is a tool that organizes and presents the essential elements of a business plan in a clear and concise format. It typically includes the following components:

⁷³ <https://www.scribd.com/document/485397145/247007835-Le-Plan-Directeur-de-Production-docx> Consulted on 19 March at 09 :44

Sales Forecasting: Sales forecasting is a method of estimating future sales based on past data and benchmarking studies for a particular industry.⁷⁴

A firm order: A firm order in business is an order that cannot be revoked, changed or cancelled.⁷⁵

The forecast available: The forecast available (DP) represents the actual quantity of available stock, from which the safety stock is subtracted. When the DP reaches zero, it means that it is necessary to replenish the stocks, but there is still physically the value of the safety stock.

The DP is used in conjunction with other indicators, such as

Production Master Plan (PDP) orders: These are firm orders before the limit of the farm area, generally proposed automatically by the system. The "end date" indicates the quantity available at the beginning of the period.

The available for sale (DAV) : The available for sale (AVS) represents the quantity of products that can still be promised to customers. It is calculated by assigning an initial value

During the first period, then adjusting this value each time a new resource becomes available, generally through an order at the end of the Master Production Plan (PDP)

$$\text{DAV1} = \text{St} - \text{CF1} - \text{CF2}$$

For the other periods, it is important to only take into account the resources of the Production Master Plan (PDP) to evaluate the provisional availability, because all the planned quantity has already been able to be sold and is therefore included in the available to date. Sell (DAV) previous.

$$\text{DAVn} = \text{PDPn} - \text{CFn} - \text{CFn+1} - \text{CFn+2} \dots$$

⁷⁴ <https://www.act.com/fr/prevision-des-ventes-methodes/#> Consulted on 28 May at 18:55

⁷⁵ <https://thepressfree.com/definition-de-commande-ferme/> Consulted on 28 May at 18:54

Forecast available calculation laws (DP)

$$DP0 = St - SS$$

$$DP1 = DP0 - PV1 - CF1$$

$$DP2 = DP1 - PV2 - CF2$$

$$DPn = DPn-1 + PDPfn - PVn - CFn$$

Table N°06: Example of PDP⁷⁶

		1	2	3		4	5	6	7
Prévision de vente		5	20	30		40	45	50	50
Commandes femmes		35	20	15		5	2		
Disponible prévisionnel	120	80	40	95		50	3	53	3
PDP (date de fin)				100				100	
Disponible vendre	A								
PDP (date de début)			100				100		

B.3. Calculation of Net Requirements

It is a management method that makes it possible to plan production resources, the capacity of the various machines, the workforce as well as to evaluate the needs for raw materials.⁷⁷

The objective of the requirements calculation is to determine the quantity of components necessary to meet the demand for finished products over a given period. In other words, the calculation of needs is an important step in production planning because it helps to avoid shortages of raw materials and to optimize production costs by avoiding unnecessary stocks.

⁷⁶ <http://istaofppts.cours.blogspot.com/2016/03/chapitre-6-management-de-ressources-de.html> Consulted on 28 May at 19:24

⁷⁷ <https://www.myfab.fr/lexique/definition-calcul-des-besoins-nets/> consulté le 19 Mars à 10 :32

The calculation of needs is based on the production BOMs which list the components necessary to manufacture the finished products. These classifications are presented in tree or matrix form.

Nomenclature : The nomenclature or BOM (Bill of materials) is the exhaustive list of parts, articles, assemblies and other materials necessary for the creation of a product.⁷⁸

The Net Requirements Calculation (NBM) is used to determine the amount of raw materials needed to produce a company's goods. CBN takes into account sales forecasts, current inventory levels and delivery times to plan raw material purchases. The role of CBN is therefore to optimize the company's inventory management by ensuring the availability of the raw materials necessary for production, while avoiding excessive inventory levels which can lead to unnecessary costs. In short, CBN makes it possible to optimize production planning, better manage production flows and improve customer satisfaction while reducing production costs.

B.3.1 Net requirement table components

Besoin brut or Gross Requirement: This is the total quantity required to meet the forecasted demand. The gross requirement is determined by taking into account sales forecasts, customer orders,

Stock prévisionnel or Stock available: This is the current quantity of the product or component available in stock. It is generally deducted from the gross requirement to obtain the net requirement.

Stock available = Stock – Gross requirement - Released orders + proposed order (start)

Ordre lancés or Released orders: These are production orders already confirmed and planned for the product or component. They are taken into account to adjust the gross requirement.

Proposed orders: "proposed orders" refer to production orders suggested by the system or planners to meet identified net requirements consider delivery date

⁷⁸ <https://formlabs.com/fr/blog/nomenclature-bom/> Consulté le 19 Mars à 11 : 35

Table N°07: Example of gross production requirements

St = 150 ; L = 500 ; D = 2

Article S		1	2	3	4	5
Besoins bruts			500	500	500	250
Ordres lancés			500			
Stocks prévisionnels	150	150	150	150	150	400
Ordres proposés	Fin			500	500	500
	Début	500	500	500		
Message : Lancer 500 S en période 1						

Source : COURTOIS (A) et autres : p.211

B.4. Scheduling of work:

Scheduling is a crucial step in production planning in the MRP system. It consists of determining the order in which production tasks must be carried out, taking into account production constraints, the availability of raw materials and delivery times.

The scheduling process begins with the definition of production priorities. This may include considerations such as delivery dates, quantities of products to be produced, available production capacities, etc. Priorities can be set manually or automatically by the MRP system based on business objectives.

Once the needs have been calculated, the MRP system proceeds with the scheduling of the production tasks taking into account the production constraints. Constraints can include factors such as production capacities, tool changeover times, transport times, etc. The MRP system uses optimization techniques to determine the most efficient order for production tasks.

Finally, the MRP system creates a production schedule that details the order in which production tasks should be performed. This calendar is used by production operators to plan their work and by supply chain managers to manage raw material deliveries and finished product shipments

C. Value Stream Mapping

And finally, as part of our study Value Stream Mapping (VSM) can be extremely relevant. VSM is a visual management technique used to represent in detail the key stages of a process, from its creation to its final delivery, identifying value-added activities and sources of waste. In this research methodology, we will explore how VSM can be used to analyse and improve processes, providing insight into the different steps involved.

And here are the steps we followed:


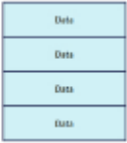
- The selection of the process: it is a production process of two pharmaceutical products
- Data Collection: Collect necessary information about the process, such as raw material flows, processing times, lead times, inventory, costs, etc. These data are specific to the company itself.
- Creation of the current Value Stream Map: Using the collected data, draw the current Value Stream Map using specific symbols and indicators. Represent the different process steps, material flows, waiting times, intermediate stocks, delays, quality issues, etc.

Value stream mapping symbols can be classified into the following categories:

- Process VSM symbols
- Material VSM symbols
- Informational VSM symbols
- General symbols

We mentioned some of each category to understand well the cartography:⁷⁹

Table N°08: Process Symbols

Symbol	Name	Description
	<p>Customer/Supplier Icon</p>	<p>The customer or supplier icon represents two different elements based on the placement.</p> <p>It represents the supplier if it is placed in the upper left corner of a value stream map.</p> <p>When it is placed in the upper right corner, it represents the customer.</p>
	<p>Databox icon</p>	<p>The data box icon represents the significant data. It is usually placed under other symbols that own this data. It can be input material used in one day, the quantity of waste or shipping frequency, etc.</p>

⁷⁹ <https://www.edrawmax.com/article/value-stream-mapping-symbols.html#> Consulted 27May at 21:51

Table N°09: Material VSM Symbols





Symbol	Name	Description
	Inventory Symbol	This inventory Value stream mapping icon can show Inventory between two processes and stored Inventory. Add the inventory count below this triangle, if required.
	Shipment Symbol	Shipment represents the shifting of procured raw materials from the supplier to the plant. It also shows the delivery of finished products from the manufacturer to the customer.
	Push Arrow	Push arrow VSM symbol is used to represent the journey of material from one process to another. It is mostly used in manufacturing.
	External Shipment	External shipment is a shipment of raw materials from the supplier or delivery of products to the customer.

Table N°10: Informational VSM Symbols






Symbol	Name	Description
	Production Control	Production control represents a central production scheduling or control department.
	Electronic info icon	The electronic info icon shows the digital information flow such as the Internet, Intranets, LANs, WANs, etc.
	MRP/ ERP	Material requirements planning (MRP) is an inventory scheduling symbol.

Table N°11: General Symbols

Symbol	Name	Description
	Transportation Symbol	This is a group of symbols showing the type of transportation. Such as trains, airplanes, boats, or ships.

	Other information icon	Useful Information
-----------------------------------------------------------------------------------	------------------------------	--------------------

- Analysis of the current Value Stream Map: Analyse the current Value Stream Map to identify value-added activities and non-essential activities. Identify sources of waste.
- Proposal for improvements: Based on the analysis of the current Value Stream Map, propose specific improvements to optimize the process.

Creation of the future Value Stream Map: Draw the future Value Stream Map which represents the optimized process after the implementation of the proposed improvements

Section 3: Presentation of the study results

A. Application of MRP to the project under study

Material Requirements Planning (MRP) is a method used to plan production and material requirements for a product. To apply this method to the study project focusing on the pharmaceutical products Nopain, Unisia, Prospan, we have performed the following calculations:

We have chosen these three pharmaceutical products due to their high demand in the market and their continuous production, as well as their varying preparation methods with different steps for each product. We have explained them in the nomenclature scheme below:

Table N°12: Pharmaceutical description of NOPAIN, PROSPAN, UNISIA

The trade name	Nopain	Unisia	Prospan
----------------	--------	--------	---------

The drug classification	Tablet,non-opioid pain reliever	Tablet, Angiotensin receptor blockers and calcium channel blockers	Syrup, Other cough suppressants and expectorants; Used in the treatment of cough.
The category	Neurological disorders	Hypertension (high blood pressure)	herbal medications
The drug family	Non-steroidal anti-inflammatory drugs (NSAIDs)	Not specified	"Ivy Leaf Extract" or "Ivy Leaf Preparations.

Source: Created by the authors

A.1. Calculation of the Industrial and Commercial Plan (ICP)

This refers to the quantity of product that needs to be produced to meet the anticipated demand. This is done by utilizing past sales data and future sales forecasts.

A.2. The nomenclature of products

Product nomenclature is a standardized system or classification scheme that helps businesses organize and identify product components and associated accounts. It assigns unique codes, names, or labels to facilitate accurate identification, inventory management, and financial tracking. It enables businesses to categorize products based on attributes and functionality, streamlining operations and improving communication. A clear and consistent nomenclature promotes collaboration and supports informed decision-making. Overall, product nomenclature enhances organizational efficiency and facilitates effective management of products and accounts.

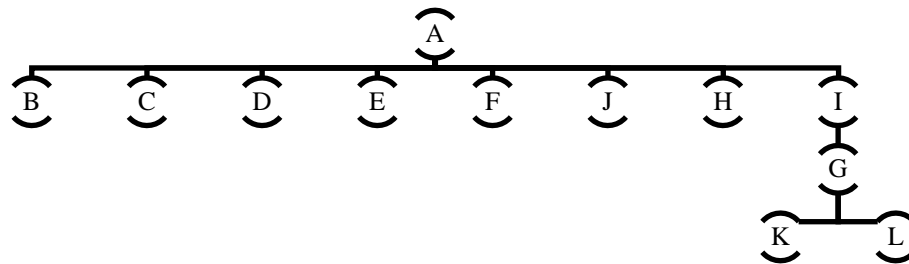
A.2.1 The nomenclature of Unisia

Table N°13: Nomenclature coding table of UNISIA

CODE MATERIA	MATERIAL DESCRIPTION	Reference
3UNSF8530	UNISIA 8/5mg TAB TAB B/30	A
2VIB4020G	VIGNETTE BLANK 40*20MM GREEN	B
2OLBL1210	OUTER LABEL BLANK 120*100 MM	C
2ALFP200	ALUM 25 oPA,45 AL,60 PVC Form Pack 199MM	D
2CB602222	Caisse fond automatique 600x220x220 MM	E
2BXUNSF8530F	UNISIA 8/5mg BOX B/30 FULL PROCESS	F
2INUNSF	UNISIA INSERTS FULL PROCESS	J
2ALUNS8532	UNISIA 8/5mg ALU FOIL (30µm) 199MM	H
9UNST85	UNISIA 8/5MG TAB	I
9UNS85I	UNISIA 8/5mg FINAL BLEND	G
1MGSTRV	MG. STEARATE VEG. GRADE PH. EUR/NF	K
3UNST85PR-ALGPRV	UNISIA 8MG/5MG TAB. PREMIX	L

Source: Created by the authors

Figure N°14: Nomenclature of UNISIA



Source: Created by the authors

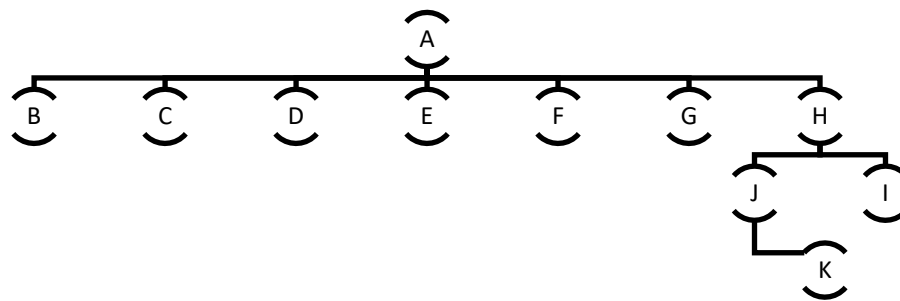
A.2.2 The nomenclature of Nopain

Table N°14: Nomenclature coding table of NOPAIN

CODE MATERIA	MATERIAL DESCRIPTION	Reference
3NOPF7520		A
2VIB4020G	VIGNETTE BLANK 40*20MM GREEN	B
2OLBL1210	OUTER LABEL BLANK 120*100 MM	C
2CB602222	Caisse fond automatique 600x220x220 MM	D
2PVCDCN1	PVC+PVDC NEUTRAL 199 MM(250/40)	E
2BXNPF20FND	NOPAIN FCT X 20 FCT BOX PROCESS New D	F
2ALNPF1	NOPAIN TAB. AL/FOIL 199MM	G
9NOPF275	NOPAIN 275 MG FCT	H
1EUDNE3	POLYACRYLATE DISP. 30% (EP)	I
9NPF27CR	NOPAIN (NAPROXEN SODIUM 275 mg) CORES	J
3NOPFNXS CFB-ALG	NOPAIN (NAPROXENE SODIQUE) FINAL BLEND	K

Source: Created by the authors

Figure N°15: Nomenclature of NOPAIN



Source: Created by the authors

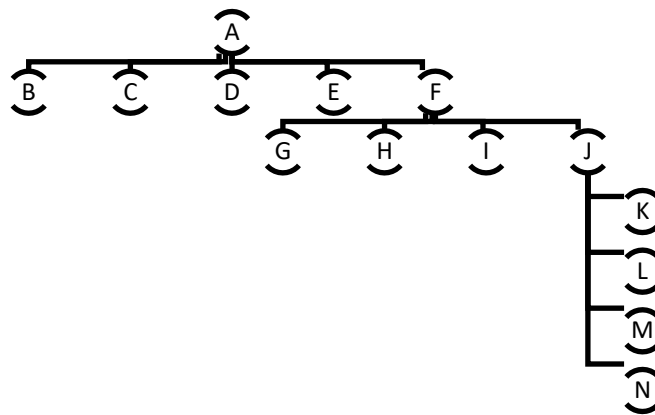
A.2.3 The nomenclature of Prospan

Table N°15: Nomenclature coding table of PROSPAN

CODE MATERIA	MATERIAL DESCRIPTION	Reference
3PRNS100	Prospan Syrup 100ML	A
2INPRNF	PROSPAN SYRUP 100ml FILLING	B
2BXPRNS1FP	PROSPAN INSERT FULL PROCESS	C
2LAPRNF	PROSPAN SYRUP 100ml BOX FULL PROCESS	D
2VIB4020W	PROSPAN LABEL FULL PROCESS	E
9PRNS100	VIGNETTE BLANK 40*20MM WHITE	F
2CAPFPR	White Cap 28mm (ASTRA)	G
2BTWOM123	125ML W/O MARK BOTTLE	H
2CUPDOS	DOSING CUPS	I
9PRNSI	PROSPAN SYRUP PREPARATION	J
1YVLEXT	IVY EXTRACT	K
1CTRCACA	CITRIC ACID ANHYDROUS	L
1SRBCRST	SORBITOL CRISTALISE	M
1FVCHERRY	CHERRY FLAVOUR	N

Source: Created by the authors

Figure N°16: Nomenclature of PROSPAN



Source: Created by the authors

A.3. The Master Production Schedule (MPS)

The Master Production Schedule (MPS), or Plan Directeur de Production in French, is a detailed plan that defines the quantities and production schedules for each finished product. It is an essential component of the overall production planning process and provides a timeframe for manufacturing operations. The MPS takes into account factors such as customer demand, sales forecasts, available inventory, and production capacity.

The MPS is a vital tool for managing production and inventory levels. It provides visibility into future production requirements, allowing for better coordination of materials and resources. This enables businesses to plan their production activities more effectively, optimize resource utilization, and maintain adequate inventory levels to meet customer demand. The MPS ensures that production activities are aligned with customer requirements while minimizing costs and maximizing efficiency.

In this section, we have calculated and created the Master Production Schedule (MPS) for three pharmaceutical products (UNISIA /PROSPAN/NOPAIN) based on the data and information provided by the planning and production team. We have arrived at these results by applying the following rules during the calculations:

Calculation of MPS (PDP):

Table N°16: Production master plan of UNISIA, NOPAIN, PROSPAN

	STOCK	LOT SIZE	Safety Stock(Stock de sécurité)	Lead Time(Delais d'obtention)	Average forecast(Prévision moyenne)	EMH(Excédent moyen de consommation)	Available forecast 0(DP)
UNISIA	1 000 000,00	100 000,00	401 666,67	15 days	398 333,33	401 666,67	598 333,33
PROSPAN	1 250 000,00	22 500,00	183 333,00	15 days	316 666,67	183 333,33	1 066 667,00
NOPAIN	1 300 000,00	100 000,00	424 167,00	15 days	287 500,00	412 500,00	875 833,00
MONTH 1							
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DPF)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)		
100 000,00	60 000,00	438 333,33	-	940 000,00	100 000,00		
50 000,00	55 000,00	961 667,00	-	1 195 000,00	-		
85 000,00	100 000,00	690 833,00	-	1 200 000,00	-		

MONTH 2					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DPF)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
400 000,00	96 000,00	42 333,33	100 000,00	4 000,00	900 000,00
200 000,00	–	761 667,00	–	–	–
300 000,00	150 000,00	240 833,00	–	–	100 000,00
MONTH 3					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DPF)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
600 000,00	300 000,00	42 333,33	900 000,00	600 000,00	900 000,00
300 000,00	150 000,00	311 667,00	–	–	157 500,00
170 000,00	90 000,00	80 833,00	100 000,00	10 000,00	800 000,00
MONTH 4					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DPF)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
800 000,00	100 000,00	42 333,33	900 000,00	800 000,00	100 000,00
400 000,00	50 000,00	19 167,00	157 500,00	107 500,00	472 500,00
700 000,00	120 000,00	60 833,00	800 000,00	680 000,00	300 000,00

MONTH 5					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DPF)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
90 000,00	4 000,00	48 333,33	100 000,00	96 000,00	700 000,00
450 000,00	20 000,00	21 667,00	472 500,00	452 500,00	495 000,00
300 000,00	–	60 833,00	300 000,00	300 000,00	200 000,00
MONTH 6					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DPF)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
400 000,00	300 000,00	48 333,33	700 000,00	400 000,00	–
500 000,00	–	16 667,00	495 000,00	495 000,00	–
170 000,00	–	90 833,00	200 000,00	90 833,00	–

Source: Created by the authors

A.4. Net Material Requirements (NMR)

Net Material Requirements (NMR) is a key step in the Material Requirements Planning (MRP) process. It is a calculation that determines the net requirements of each component or raw material needed for the production of a finished product, taking into account the demand, available stocks, and open orders.

Net Material Requirements within the MRP process is a vital step in determining the net requirements of components or raw materials, aiming to optimize production planning, minimize inventory costs, and effectively meet customer demand.

A.4.1 Gross material requirements

Gross requirements, also known as "gross material requirements" or "gross demand," refer to the total quantity of a component or raw material required for the production of a finished product. These gross requirements are calculated based on the forecasted demand for the product, the quantities needed per unit produced, as well as the quantities allocated for existing orders. Gross requirements are a critical step in the production planning process, helping determine the quantities needed to be acquired or produced to meet market demand.

We have gathered the initial requirements for producing each product reference to establish the infrastructure for each product. These will serve as a preliminary basis for determining the raw material needs of each product, along with the information available in the Master Production Schedule. By doing so, we can determine the quantity required of raw materials for each product and ensure their availability to facilitate smooth production processes according to the specified plan.

Table N°17: Gross Production Requirements for Unisia

Reference	Quantity	Unity
A	100000	EA
B	100000	EA
C	640	EA
D	625	KG
E	640	EA
F	100000	KG
J	100000	KG
H	350	TAB
I	3000000	TAB
G	610	KG
K	20	KG
L	500	TAB

Source: Created by the authors

Table N°18: Gross Production Requirements for Nopain

Référence	quantité	unité
A	100000	EA
B	100000	EA
C	834	EA
D	834	EA
E	535	KG
F	100000	EA
G	89	KG
H	1999955	TAB
I	15	KG
J	1999955	TAB
K	1500	KG

Source: Created by the authors

Table N°19: Gross Production Requirements for Prospan

Référence	quantité	unite
A	225000	EA
B	100000	EA
C	100000	EA
D	100000	EA
E	100000	EA
F	100000	EA
G	100000	EA
H	100000	EA
I	100000	EA
J	12000	L
K	100	KG
L	20	KG
M	10200	KG
N	100	KG

Source: Created by the authors

A.4.2 Net Requirements Calculation:

Table N°20: Net Requirement Calculation for UNISIA

RG

	MATERIAL CODE	MATERIAL DESCRIPTION	Stock	Lot	delivrey
UNISIA	2VIB4020G	VIGNETTE BLANK 40*20MM GREEN	1 000 000,00	100 000,00	1Month
	20LBL1210	OUTER LABEL BLANK 120*100 MM	10 000,00	500,00	1Month
	2ALFP200	ALUM 25 oPA,45 AL,60 PYC Form Pack 199MM	10 000,00	700,00	1Month
	2CB602222	Caisse food automatique 600x220x220 MM	45 000,00	900,00	1Month
	2BXUNSF8530F	UNISIA 8/5mg BOX B/30 FULL PROCESS	800 000,00	150 000,00	1Month
	2INUNSF	UNISIA INSERTS FULL PROCESS	250 000,00	50 000,00	1Month
	2ALUNS8532	UNISIA 8/5mg ALU FOIL (30µm) 199MM	10 000,00	200,00	1Month
	3UNST85	UNISIA 8/5MG TAB	10 000 000,00	1 000 000,00	1Month
	3UNS851	UNISIA 8/5mg FINAL BLEND	20 000,00	200,00	1Month
	1MGSTRY	MG. STEARATE YEG. GRADE PH. EUR/NF	250,00	50,00	1Month
	3UNST85PR-ALGPRV	UNISIA 8MG/5MG T.A.B. PREMIX	2 000,00	400,00	1Month

Month1				
Bb	OL	SPf	OPf	Opd
100000,00		900000,00		
640,00		9360,00		
625,00		9375,00		
640,00		44360,00		
100000,00		700000,00		300000,00
100000,00		150000,00		800000,00
350,00		9650,00		
3000000,00		7000000,00		21000000,00
610,00		19390,00		
20,00		230,00		
500,00		1500,00		3200,00
Month 2				
Bb	OL	SPf	OPf	OPd
900000,00		0,00		1000000,00
5760,00		3600,00		3000,00
5625,00		3750,00		2100,00
5760,00		38600,00		
900000,00		100000,00	300000,00	900000,00
900000,00		50000,00	800000,00	900000,00
3150,00		6500,00		
27000000,00		1000000,00	21000000,00	26000000,00
5490,00		13900,00		
180,00		50,00		150,00
4500,00		200,00	3200,00	4400,00

Month 3				
Bb	OL	SPf	OPf	OPd
900000,00		100000,00	1000000,00	
5760,00		840,00	3000,00	
5625,00		225,00	2100,00	700,00
5760,00		32840,00		
900000,00		100000,00	900000,00	
900000,00		50000,00	900000,00	50000,00
3150,00		3350,00		
27000000,00		0,00	26000000,00	3000000,00
5490,00		8410,00		
180,00		20,00	150,00	
4500,00		100,00	4400,00	400,00
Month 4				
Bb	OL	SPf	OPf	OPd
100000,00		0,00		700000,00
640,00		200,00		4500,00
625,00		300,00	700,00	4200,00
640,00		32200,00		
100000,00		0,00		750000,00
100000,00		0,00	50000,00	700000,00
350,00		3000,00		
3000000,00		0,00	3000000,00	21000000,00
610,00		7800,00		
20,00		0,00		150,00
500,00		0,00	400,00	3600,00
Month 5				
Bb	OL	SPf	OPf	OPd
700000,00		0,00	700000,00	
4480,00		220,00	4500,00	
4375,00		125,00	4200,00	
4480,00		27720,00		
700000,00		50000,00	750000,00	
700000,00		0,00	700000,00	
2450,00		550,00		
21000000,00		0,00	21000000,00	
4270,00		3530,00		
140,00		10,00	150,00	
3500,00		100,00	3600,00	

Month 6				
Bb	OL	SPf	OPf	OPd
		0,00		
		220,00		
		125,00		
		27720,00		
		50000,00		
		0,00		
		550,00		
		0,00		
		3530,00		
		10,00		
		100,00		

Source: Created by the authors

Table N°21: Net Requirement Calculation for NOPAIN

	MATERIAL CODE	MATERIAL DESCRIPTION	Stock	Lot	delivrey
NOPAIN	2VIB4020G	VIGNETTE BLANK 40*20MM GREEN	240 000,00	100 000,00	1Month
	2OLBL1210	OUTER LABEL BLANK 120*100 MM	2 000,00	500,00	1Month
	2CB602222	Caisse fond automatique 600x220x220 MM	1 900,00	300,00	1Month
	2PVCDCN1	PVC+PVDC NEUTRAL 199 MM(250/40)	2 000,00	700,00	1Month
	2BXNPF20FND	NOPAIN FCT X 20 FCT BOX PROCESS New D	260 000,00	100 000,00	1Month
	2ALNPF1	NOPAIN TAB. AL/FOIL 199MM	300,00	150,00	1Month
	9NOPF275	NOPAIN 275 MG FCT	4 200 000,00	500 000,00	1Month
	1EUDNE3	POLYACRYLATE DISP. 30% (EP)	40,00	15,00	1Month
	9NPF27CR	NOPAIN (NAPROXEN SODIUM 275 mg) CORES	4 500 000,00	500 000,00	1Month
	3NOPFNXSCFB-ALG	NOPAIN (NAPROXENE SODIQUE) FINAL BLEND	8 000,00	2 000,00	1Month
Month1					
Bb	OL	SPf	OPf	Opd	
		240 000,00			
		2 000,00			
		1 900,00			
		2 000,00			
		260 000,00			
		300,00			
		4 200 000,00			
		40,00			
		4 500 000,00			
		8 000,00			

Month 2				
Bb	OL	SPf	OPf	OPd
100000,00		140000,00		700000,00
834,00		1166,00		6000,00
834,00		1066,00		5700,00
535,00		1465,00		3500,00
100000,00		160000,00		700000,00
89,00		211,00		600,00
1999955,00		2200045,00		14000000,00
15,00		25,00		105,00
1999955,00		2500045,00		13500000,00
1500,00		6500,00		6000,00
Month 3				
Bb	OL	SPf	OPf	OPd
800000,00		40000,00	700000,00	300000,00
6672,00		494,00	6000,00	2500,00
6672,00		94,00	5700,00	2700,00
4280,00		685,00	3500,00	1400,00
800000,00		60000,00	700000,00	300000,00
712,00		99,00	600,00	300,00
15999640,00		200405,00	14000000,00	6000000,00
120,00		10,00	105,00	45,00
15999640,00		405,00	13500000,00	6000000,00
12000,00		500,00	6000,00	6000,00
Month 4				
Bb	OL	SPf	OPf	OPd
300000,00		40000,00	300000,00	200000,00
2502,00		492,00	2500,00	1500,00
2502,00		292,00	2700,00	1500,00
1605,00		480,00	1400,00	700,00
300000,00		60000,00	300000,00	200000,00
267,00		132,00	300,00	150,00
5999865,00		200540,00	6000000,00	4000000,00
45,00		10,00	45,00	30,00
5999865,00		540,00	6000000,00	4000000,00
4500,00		2000,00	6000,00	2000,00

Month 5				
Bb	OL	SPf	OPf	OPd
200000,00		40000,00	200000,00	
1668,00		324,00	1500,00	
1668,00		124,00	1500,00	
1070,00		110,00	700,00	
200000,00		60000,00	200000,00	
178,00		104,00	150,00	
3999910,00		200630,00	4000000,00	
30,00		10,00	30,00	
3999910,00		630,00	4000000,00	
3000,00		1000,00	2000,00	
Month 6				
Bb	OL	SPf	OPf	OPd
		40000,00		
		324,00		
		124,00		
		110,00		
		60000,00		
		104,00		
		200630,00		
		10,00		
		630,00		
		1000,00		

Source: Created by the authors

Table N°22: Net Requirement Calculation for PROSPAN

	MATERIAL CODE	MATERIAL DESCRIPTION	Stock	Lot	delivrey
PROSPAN	2BXPNS1FP	PROSPAN INSERT FULL PROCESS	450 000,00	30 000,00	1Month
	2LAPRNF	PROSPAN SYRUP 100ml BOX FULL PROCESS	300 000,00	10 000,00	1Month
	2VIB4020W	PROSPAN LABEL FULL PROCESS	3 500 000,00	50 000,00	1Month
	9PRNS100	VIGNETTE BLANK 40*20MM WHITE	400 000,00	45 000,00	1Month
	2CAPFPR	White Cap 28mm (ASTRA)	500 000,00	30 000,00	1Month
	2BTWOM123	125ML W/O MARK BOTTLE	900 000,00	55 000,00	1Month
	2CUPDOS	DOSING CUPS	500 000,00	20 000,00	1Month
	9PRNSI	PROSPAN SYRUP PREPARATION	9 000,00	4 000,00	1Month
	1YVLEXT	IVY EXTRACT	30,00	10,00	1Month
	1CTRCACA	CITRIC ACID ANHYDROUS	9,00	5,00	1Month
	1SRBCRST	SORBITOL CRISTALISE	3 000,00	1 000,00	1Month
	1FVCHERRY	CHERRY FLAVOUR	100,00	15,00	1Month
Month1					
	Bb	OL	SPf	OPf	Opd
			240 000,00		
			2 000,00		
			1 900,00		
			2 000,00		
			260 000,00		
			300,00		
			4 200 000,00		
			40,00		
			4 500 000,00		
			8 000,00		
Month 2					
	Bb	OL	SPf	OPf	OPd
			450000,00		
			300000,00		
			3500000,00		
			400000,00		
			500000,00		
			900000,00		
			500000,00		
			9000,00		4000,00
			30,00		130,00
			9,00		25,00
			3000,00		14000,00
			100,00		60,00

Month 3				
Bb	OL	SPf	OPf	OPd
157500,00		292500,00		180000,00
157500,00		142500,00		330000,00
157500,00		3342500,00		
157500,00		242500,00		275000,00
157500,00		342500,00		135000,00
157500,00		742500,00		
157500,00		342500,00		140000,00
18900,00		-5900,00	4000,00	64000,00
158,00		2,00	130,00	500,00
32,00		2,00	25,00	100,00
16065,00		935,00	14000,00	50000,00
158,00		2,00	60,00	480,00
Month 4				
Bb	OL	SPf	OPf	OPd
472500,00		0,00	180000,00	510000,00
472500,00		0,00	330000,00	500000,00
472500,00		2870000,00		
472500,00		45000,00	275000,00	450000,00
472500,00		5000,00	135000,00	510000,00
472500,00		270000,00		275000,00
472500,00		10000,00	140000,00	500000,00
56700,00		1400,00	64000,00	60000,00
473,00		29,00	500,00	500,00
95,00		7,00	100,00	100,00
48195,00		2740,00	50000,00	50000,00
473,00		9,00	480,00	495,00
Month 5				
Bb	OL	SPf	OPf	OPd
495000,00		15000,00	510000,00	
495000,00		5000,00	500000,00	
495000,00		2375000,00	0,00	
495000,00		0,00	450000,00	
495000,00		20000,00	510000,00	
495000,00		50000,00	275000,00	
495000,00		15000,00	500000,00	
59400,00		2000,00	60000,00	
495,00		34,00	500,00	
99,00		8,00	100,00	
50490,00		2250,00	50000,00	
495,00		9,00	495,00	

Month 6				
Bb	OL	SPf	OPf	OPd
		15000,00		
		5000,00		
		2375000,00		
		0,00		
		20000,00		
		50000,00		
		15000,00		
		2000,00		
		34,00		
		8,00		
		2250,00		
		9,00		

Source: Created by the authors

B. The Value Stream Mapping

In order to conduct our research study effectively, we will present in this section the approach for creating the Value Stream Mapping from the current state to the creation of the VSM for the future state (target), as well as the definition of the action plan and its implementation.

B.1. Steps for creating a VSM for the current state and future state (target):

The process of creating a VSM (Value Stream Mapping) consists of multiple steps, as outlined in section one of this chapter. However, it is important to note that these steps can vary depending on the specific case being studied. In this section, we will apply the necessary steps to develop a VSM tailored to our case study, which focuses on HIKMA PHARMA.

Step 0:

Since VSM is part of the DMAIC approach, as mentioned in Section One of this chapter, the first step is to conduct a QOQCP to properly define the problem. This step precedes the creation of a VSM map and involves the application of certain tools (which, like VSM, align with the Lean

concept) to help us analyze all dimensions of a problem and identify the areas to focus our study on. In our case, I have chosen to use the QQQQCP tool.

To properly frame the problem, let's conduct a QQQQCP analysis:

Quoi (What): The issue at hand is the management of physical and information flows at Hikma.

Qui (Who): The individuals involved in this problem are the employees of Hikma Pharma.

Où (Where): The problem is specific to the production unit located in Staoueli.

Quand (When): The problem arises during the production of products, specifically Unisia/Nopain.

Comment (How): The focus is on analyzing the production lead time.

Pourquoi (Why): The objective is to analyze the flows and optimize them for improved efficiency.

By conducting a QQQQCP analysis, we can gain a better understanding of the problem and lay the foundation for addressing it effectively.

Step 1:

Define the product family based on two variables:

-Complexity of the manufacturing process:

- Number of steps required to manufacture the product
- Duration of fabrication for each step
- Number of machines and operators involved

-Product quality requirements:

- Quantity of quality tests required
- Regulatory or industry standards for raw materials and quality

-Choice of product family:

Tablets (Nopain/Unisia)

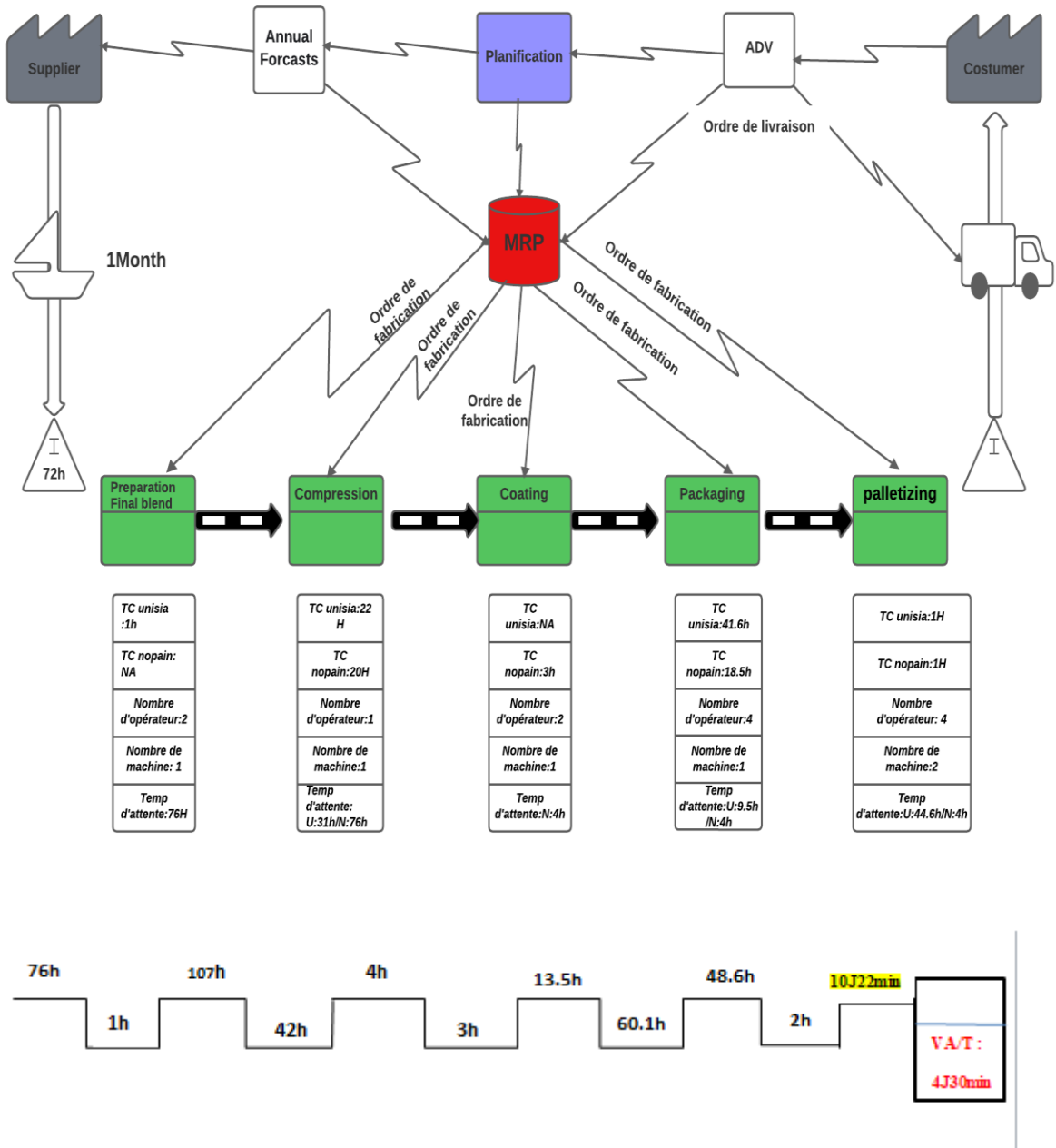
-The manufacturing steps are as follows:

1. Preparation / Final Blend
2. Compression
3. Coating
4. Packaging
5. Palletizing
6. Step 2: VSM Mapping

In this step, we will create a Value Stream Map (VSM) to visualize and analyze the current state of the process. The VSM will provide insights into the flow of materials, information, and activities involved in the production of the chosen product family.

By mapping the value stream, we can identify areas of waste, bottlenecks, and opportunities for improvement. The VSM will help us understand the current process and serve as a foundation for future optimization efforts.

Figure N°17: Current VSM Map of Unisia and Nopain Product Production



Source: Created by the authors

B.1.1 Analysis of Current VSM Maps:

Analysis of the current VSM mapping: In the process of developing a VSM map, the next step is analysis. In this part, we will analyze all the elements present in the current VSM maps.

-Processes: There are 6 processes, all triggered by the production order. Each process step, including inputs, activities performed, and outputs produced, is analyzed. The cycle time for each product, the number of operators and machines, machine capacity, waiting time, etc.

-Information system: The information system, which connects almost all stakeholders, is efficient and has a low error rate, greatly facilitating communication. However, there are also certain shortcomings associated with this software. For example:

Need for integration with other systems: MRP software often needs to be integrated with other enterprise systems such as inventory management systems, sales and operations planning (S&OP) systems, or Enterprise Resource Planning (ERP) systems. Integration can be complex and require additional efforts to ensure synchronization and interoperability between these systems.

Difficulty in handling changes: MRP software may struggle to adapt to rapid changes in demand, supplier delivery times, or capacity constraints. If planning parameters are not adjusted in real-time or if data updates are not made promptly, it can lead to outdated or inappropriate plans.

-Information flows: The organization of production demonstrates a strong coherence in the development of information flows.

-Physical flows: Product manufacturing is initiated based on the production order, and each product follows a specific production process. For example, some products require passing through the mixer machine to obtain the final blend (e.g., Unisia), while in the case of Nopain, the company imports it as a final blend. At the dyeing stage, Unisia does not concern itself, so it moves directly to packaging. In general, the production stages that involve machines include final blend preparation, compression, coating, packaging, and palletizing.

The analysis of VSM (Value Stream Mapping) primarily aims to identify bottlenecks and sources of waste within the current value stream.

As we can see in the Value Stream Mapping (VSM), the bottleneck is centered on the packaging stage, which we have identified through the longest cycle time for the products. This means that the packaging machine takes much more time compared to other machines, resulting in delays in the other production stages and an increase in waiting time. For further clarification, here is the following table:

Table N°23: The different manufacturing steps for UNISIA and NOPAIN

	Reception to the inventory	Preparation/final blend	Compression	coating	packaging	palletizing
Unisia	72 H	Machine setup:4H Run:1H Full clean:7H	Machine setup:4H Run:22H Full clean:7H	Machine setup:NA Run:NA Full clean:NA	Machine setup:4H Run:41,6H Full clean:4H	Machine setup:4H Run:1H
Waiting time		76H	31H		9,5H	44,6H
Nopain	72 H	Machine setup:NA Run:NA Full clean:NA	Machine setup:4H Run:20H Dc:1H Full clean:7H	Machine setup:4H Run:3H Full clean:7H	Machine setup:4H Run:18,5H Dc:1H Full clean:4H	Machine setup:4H Run:1H
Waiting time			76H	4H	4H	4H

Source: Created by the authors

We performed this task considering that the lot size for Unisia and Nopain is 100,000. This is specifically related to MRP, particularly the Production Planning Table (PDP). It is important to note that the manufacturing process for these products is cyclical. For example, 100,000 units of Unisia are followed by 100,000 units of Nopain, and so on. This results in significant time loss during the conversion process for machine cleaning and sterilization, as pharmaceutical manufacturing is a highly sensitive and delicate stage. Any technical malfunction or lack of cleanliness in the machines from the first product onwards leads to serious consequences. All this time lost contributes to an increase in lead time for delivery.

B.1.2 Definition of the action plan

In Value Stream Mapping (VSM), the action plan is a set of specific steps and initiatives aimed at addressing issues, improving the value stream, and eliminating waste. It is developed after analyzing the current state VSM and serves as a roadmap for guiding the future state design and implementation.

The action plan involves identifying and implementing actions to reduce bottlenecks, streamline processes, improve efficiency, and enhance overall value delivery. It may include process changes, equipment upgrades, training programs, or standardization initiatives.

The action plan is a systematic approach to continuous improvement, outlining the sequence of actions, responsible individuals or teams, target completion dates, and expected outcomes. It ensures that opportunities for improvement are addressed effectively, leading to optimized value streams and improved performance.

So, we propose some solutions to reduce waiting time and relieve the pressure on the bottleneck:

For example, instead of having a cyclic production of the two products, we can manufacture a batch of Product A first, followed by introducing a batch of Product B in the production cycle. This helps to reduce waiting time, especially the time required for cleaning and sterilizing the machines between the products, and speeds up delivery. Another solution is to study the possibility of increasing the lot size, taking into account the machines' production capacity and

the quantity allowed and approved by the ministry. Another solution, although challenging to implement due to financial constraints, is to alleviate the pressure on the bottleneck by adding new packaging machines, which would accelerate the production cycle.

Implementing more efficient planning: Optimize production planning by considering the capacity constraints of the bottleneck. This can involve implementing advanced planning systems, using computerized planning tools, or adjusting schedules to better distribute the workload.

Implementing just-in-time (JIT) production methods: Adopt JIT production methods to reduce intermediate stocks and waiting times. This involves synchronizing production with actual demand, avoiding overproduction, and minimizing downtime.

Implementing continuous improvement tools: Use tools and methodologies such as Lean Six Sigma for continuous improvement to identify and eliminate waste and inefficiencies in the process.

These solutions can contribute to reducing waiting time, improving efficiency, and alleviating pressure on the bottleneck, thereby optimizing the flow of value in the process.

B.1.3 Implementation

The last step of the process, which can only be carried out after the plan has been validated by the relevant party, involves implementing the plan, training employees, supervising the changes, and monitoring progress.

C. Correlation Analysis

With the objective of evaluating the relationship and assessing the degree of co-variation among various variables, we have selected 8 variables for analysis, including product availability, customer satisfaction, on-time delivery rate, stock turnover rate, revenue, MRP utilization rate, sales growth rate, and stock turnover rate.

C.1. Correlation Calculation

To calculate the correlation between the variables, we can use Pearson's correlation coefficient formula:

$$r = \frac{\text{Covariance}}{E_x * E_y}$$

C.1.1 Correlation between Customer Satisfaction on a scale of 1-10 and Product Availability Rate

Table_N°24: Evolution of the product availability concurrently with the product satisfaction

	Product Availability %	Customer Satisfaction
August	60	4
September	67	5
October	70	6
November	75	6.75
December	77	7
January	82	7.5

Source: Created by the authors

- The product availability rate represents the period when the product is available compared to the period when it should have been available
- N is the number of data
- X and y are the values of the two variables
- $\sum x$ is the sum of all values of the first variable
- $\sum y$ is the sum of all values of the second variable

Applying this formula to the data above, we have: $n = 6 / \sum x = 431 / \sum y = 36.25$

1. Calculate the mean of the two variables:

$$Mo = \frac{X_1 + X_2 + \dots + X_n}{1 + 2 + \dots + n}$$

Availability of products:

$$Mo = \frac{60 + 67 + 70 + 75 + 77 + 82}{6} = 71.83$$

Customer satisfaction:

$$Mo = \frac{4 + 5 + 6 + 6.75 + 7 + 7.5}{6} = 6.041$$

2. Calculate the standard deviation of the two variables:

$$E = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (X_i - Mo)^2}$$

The availability of products:

E

=

$$\sqrt{\frac{1}{5} ((60 - 71.83)^2 + (67 - 71.83)^2 + (70 - 71.83)^2 + (75 - 71.83)^2 + (77 - 71.83)^2 + (82 - 71.83)^2)}$$

= 7.83

Customer satisfaction:

E

=

$$\sqrt{\frac{1}{5} ((4 - 6.041)^2 + (5 - 6.041)^2 + (6 - 6.041)^2 + (6.75 - 6.041)^2 + (7 - 6.041)^2 + (7.5 - 6.041)^2)}$$

= 1,326.

3. Now we will calculate the covariance between the two variables using the following formula:

Covariance = $\sum_{i=1}^n \frac{(X_i - Mox) * (Y_i - Moy)}{(n-1)}$, *Mox* Represents the Average of variable x, *Moy* represents the average of variable y.

$$\text{➤ } ((60 - 71.83)X(4 - 6.041) + (67 - 71.38)X(5 - 6.041) + (70 - 71.83)X(6 - 6.041) + (75 - 71.83)X(6.75 - 6.041) + (77 - 71.83)X(7 - 6.041) + (82 - 71.83)X(7.5 - 6.041))/5$$

$$51,29168/5 = 10.26$$

Covariance is equal to 10.26

4. Finally, we calculate the correlation between product availability rates and customer satisfaction

$$r = \frac{\text{Covariance}}{Ex * Ey}$$

Using the data above, we get:

$$r = 0.98$$

Comment: A correlation coefficient of 0.98 demonstrates a robust positive correlation between product availability and customer satisfaction. This signifies a strong linear association between the two variables, implying that as product availability improves, customer satisfaction tends to rise significantly.

C.1.2 Correlation between on-time delivery rate and stock turnover rate

Table N°25: Evolution of the on-delivery rate concurrently with the inventory turnover rate

	The on-time delivery rate (OTD - On Time Delivery).	Inventory turnover rate
<u>August</u>	85%	4
<u>September</u>	90%	5
<u>October</u>	82%	3
<u>November</u>	87%	4
<u>December</u>	89%	5
<u>January</u>	86%	4

Source : Created by the authors

- N is the number of data
- X and y are the values of the two variables
- $\sum x$ is the sum of all values of the first variable
- $\sum y$ is the sum of all values of the second variable

Applying this formula to the data above, we have: $n = 6$ $\sum x = 519$ $\sum y = 25$

1. Calculate the mean of the two variables:

$$Mo = \frac{X1+X2+\dots+Xn}{1+2+\dots+n}$$

Delivery on time:

$$Mo = \frac{85+90+82+87+89+86}{6} = 86.50$$

Inventory turn-over:

$$Mo = \frac{4+5+3+4+5+4}{6} = 4.166.$$

2. Calculate the standard deviation of the two variables:

$$E = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (Xi - Mo)^2}$$

On time delivery rate:

E

=

$$\sqrt{\frac{1}{5}((85 - 86.50)^2 + (90 - 86.50)^2 + (82 - 86.50)^2 + (87 - 86.50)^2 + (89 - 86.50)^2 + (86 - 86.50)^2)}$$

$$= 2.881$$

The stock turnover rate:

E

=

$$\sqrt{\frac{1}{5}((4 - 4.166)^2 + (5 - 4.166)^2 + (3 - 4.166)^2 + (4 - 4.166)^2 + (5 - 4.166)^2 + (4 - 4.166)^2)}$$

$$= 0.752$$

3. Now we will calculate the covariance between the two variables using the following formula:

$$\text{Covariance} = \sum_{i=1}^n \frac{(Xi - Mox) * (Yi - Moy)}{(n-1)}, \text{ Mox Represents the Average of the variable x, Moy}$$

represents the average of the variable y.

$$\begin{aligned} &\text{➤ } ((85 - 86.50)(4 - 4.166) + (90 - 86.50)(5 - 4.166) + (82 - 86.50)(3 - 4.166) + \\ &\quad (87 - 86.50)(4 - 4.166) + (89 - 86.50)(5 - 4.166) + (86 - 86.50)(4 - 4.166))/5 \end{aligned}$$

$$\text{➤ } 10.5/5 = 2.1$$

Covariance is equal to 2.1

4. Finally, we calculate the correlation between on-time delivery rates and stock turnover rates

$$r = \frac{\text{Covariance}}{E_x * E_y}$$

Using the data above, we get:

$$r = \frac{2.1}{2.881 * 0.752}$$

$$r = 0.96$$

Comment: A correlation of 0.96 indicates a strong positive correlation between on-time delivery rate and inventory turnover rate. This suggests that there is a strong linear relationship between the two variables, i.e., as on-time delivery rate increases, inventory turnover rate tends to increase as well.

C.1.3 Correlation between Prospan /Nopain /Unisia turnover and MRP utilization rate

Table N°26: Evolution of the revenue concurrently with the MRP utilization rate

	Revenue (thousands) of dollars	MRP utilisation rate
<u>August</u>	1620	40
<u>September</u>	1854	55
<u>October</u>	2001.55	60
<u>November</u>	3512.5	70
<u>December</u>	3714.2	75
<u>January</u>	3912.78	80

Source: Created by the authors

- $\text{MRP utilization rate}(m) = \frac{\text{number of production days (use MRP to plan)}}{\text{number of production days}} * 100$

➤ The revenue = (sum ((Sales forecasts + Firme orders) * sale price))

- N is the number of data
- X and y are the values of the two variables
- $\sum x$ is the sum of all values of the first variable
- $\sum y$ is the sum of all values of the second variable

Applying this formula to the data above, we have: $n = 6$ / $\sum x = 16615.03$ / $\sum y = 380$

1. Calculate the mean of the two variables:

$$MO = \frac{X1+X2+\dots+Xn}{1+2+\dots+n}$$

Revenue (thousands) of dollars:

$$MO = \frac{1620 + 1854 + 2001.55 + 3512.5 + 3714.2 + 3912.78}{6} = 2769.171$$

MRP utilization rate:

$$MO = \frac{40 + 55 + 60 + 70 + 75 + 80}{6} = 63.333.$$

2. Calculate the standard deviation of the two variables:

$$E = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (Xi - MO)^2}$$

Revenue (thousands) of dollars:

$$E = \sqrt{\left(\frac{1}{5} \left((1620 - 2769.171)^2 + (1854 - 2769.171)^2 + (2001.55 - 2769.171)^2 + (3512.5 - 2769.171)^2 + (3714.2 - 2769.171)^2 + (3912.78 - 2769.171)^2 \right)\right)} = 1048.89$$

MRP utilization rate:

$$E = \sqrt{\left(\frac{1}{5} \left((40 - 63.333)^2 + (55 - 63.333)^2 + (60 - 63.333)^2 + (70 - 63.333)^2 + (75 - 63.333)^2 + (80 - 63.333)^2 \right) \right)} = 14.71$$

3. Now we will calculate the covariance between the two variables using the following formula:

$$\text{Covariance} = \sum_{i=1}^n \frac{(X_i - Mox) * (Y_i - Moy)}{(n-1)}, \text{ } Mox \text{ Represents the Average of the variable x, } Moy$$

represents the average of the variable y.

$$\begin{aligned} &\triangleright ((1620 - 2769.171) (40 - 63.333) + (1854 - 2769.171) (55 - 63.333) + \\ &\quad (2001.55 - 2769.171) (60 - 63.333) + (3512.5 - 2769.171) (70 - 63.333) + \\ &\quad (3714.2 - 2769.171) (75 - 63.333) + (3912.78 - 2769.171) (80 - 63.333)) / 5 \\ &\triangleright 72040.16667 / 5 = 14408.033 \end{aligned}$$

Covariance is equal to 14408.033

4. Finally, we calculate the correlation between Revenue (thousands) of dollars and stock MRP utilization rate:

$$r = \frac{\text{Covariance}}{E_x * E_y}$$

Using the data above, we get:

$$r = \frac{14408.033}{1048.888 * 14.719}$$

$$r = 0.933$$

Comment:

The correlation coefficient is **0.933**, suggesting a strong positive correlation between revenue and MRP utilization rate. This implies that as the MRP utilization rate increases, revenue also tends to increase.

These findings are significant as they highlight the importance of MRP implementation in production and its contribution to the company's commercial performance. By effectively using MRP to plan production, the company can respond to customer demand in a timely and efficient manner, thereby increasing sales and revenue.

However, it is important to note that correlation does not prove causality, and other factors may also influence the relationship between the two variables. Therefore, further analysis is necessary to better understand the factors that can affect commercial performance and MRP utilization, in order to make informed decisions to improve production and sales for the company.

Several factors can influence the relationship between MRP utilization rate and revenue. Here are some examples:

- Product quality: Poor product quality can lead to decreased sales, even with efficient production planning using MRP.
- Competition: Strong competition in the market can impact sales, regardless of efficient production planning with MRP.
- Customer demand: Customer demand can vary based on seasons or specific events, which can impact sales.
- Availability of raw materials: If the required raw materials for production are not available, it can result in decreased production and sales.
- Production capacity: Limited production capacity can lead to decreased sales, even with effective MRP utilization.

In conclusion, it is important to consider these factors and others to have a more comprehensive view of the relationship between MRP utilization rate and revenue. By better understanding these factors, the company can improve its production, commercial performance, and overall profitability.

C.1.4 Correlation between sales growth rate and inventory turnover rate

Table N°27: Evolution of the sales growth rate concurrently with the stock turnover rate

	The sales growth rate	The stock turnover rate
<u>August</u>	10%	4
<u>September</u>	15%	5
<u>October</u>	8%	3
<u>November</u>	12%	4
<u>December</u>	16%	5
<u>January</u>	11%	4

Source: Created by the authors

➤ Sales Growth Rate = $\left(\frac{\text{Current Sales} - \text{Previous Sales}}{\text{Previous Sales}} \right) \times 100\%$

- N is the number of data
- X and y are the values of the two variables
- $\sum x$ is the sum of all values of the first variable
- $\sum y$ is the sum of all values of the second variable

Applying this formula to the data above, we have: $n = 6 / \sum x = 72 / \sum y = 25$

1. Calculate the mean of the two variables:

$$Mo = \frac{X1+X2+\dots+Xn}{1+2+\dots+n}$$

The sales growth rate:

$$Mo = \frac{10+15+8+12+16+11}{6} = 12$$

The stock turnover rate:

$$Mo = \frac{4+5+3+4+5+4}{6} = 4.166.$$

2. Calculate the standard deviation of the two variables:

$$E = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (Xi - Mo)^2}$$

The sales growth rate:

$$E = \sqrt{(1/5)((10 - 12)^2 + (15 - 12)^2 + (8 - 12)^2 + (12 - 12)^2 + (16 - 12)^2 + (11 - 12)^2)} = 3.033$$

The stock turnover rate:

$$E = \sqrt{(1/5)((4 - 4.166)^2 + (5 - 4.166)^2 + (3 - 4.166)^2 + (4 - 4.166)^2 + (5 - 4.166)^2 + (4 - 4.166)^2)} = 0.75$$

3. Now we will calculate the covariance between the two variables using the following formula:

Covariance = $\sum_{i=1}^n \frac{(Xi - Mox) * (Yi - Moy)}{(n-1)}$, *Mox* Represents the Average of the variable x, *Moy* represents the average of the variable y.

$$\begin{aligned} &\text{➤ } ((10 - 12)(4 - 4.166) + (15 - 12)(5 - 4.166) + (8 - 12)(3 - 4.166) + \\ &\quad (12 - 12)(4 - 4.166) + (16 - 12)(5 - 4.166) + (11 - 12)(4 - 4.166))/5 \\ &\text{➤ } \frac{0.332 + 3.502 + (-3.336) + (4.664) + (3.336) + 0.166}{5} = \frac{11}{5} = 2.2 \end{aligned}$$

Covariance is equal to 2.2

4. Finally, we calculate the correlation between the sales growth rates

The stock turnover rate:

$$r = \frac{\text{Covariance}}{Ex * Ey}$$

Using the data above, we get:

$$r = \frac{2.2}{3.033 \cdot 0.75}$$

$$r = 0.96$$

Comment: The correlation coefficient between the inventory turnover rate and the sales growth rate is therefore 0.964, which suggests a strong positive correlation between these two variables. This means that there is a strong relationship between the speed with which the company sells its inventory and the growth of its sales.

This suggests that the application of MRP has a positive impact on the business performance of the company, boosting both sales and inventory management.

Section 4: Synthesis and analysis of the study results

In this section, we delve into the analysis and synthesis of the study results to assess the impact of Material Requirements Planning (MRP) on the functioning of the company and its commercial performance. By thoroughly examining the obtained results, we aim to gain valuable insights into the contribution of MRP to various aspects of the organization, including inventory management, production planning, and overall operational efficiency. Through this comprehensive analysis, we can evaluate the effectiveness of the MRP system in achieving business goals and improving commercial performance.

a) MRP contribution analysis

- 1. Reduced stock shortages:** MRP calculates the requirements for raw materials, components, and other resources necessary for production. By utilizing demand forecasts, MRP generates purchase recommendations to prevent stock shortages and ensure the availability of essential materials at the right time.

When examining Annexe 2 as an example, it is evident that the company has predicted sales orders for both UNISIA and NOPAIN. The forecasted quantities are as follows: 400,000 and 300,000 for UNISIA, while firm orders are 96,000 and 150,000 respectively for the second month. To prevent stockouts for UNISIA, Hikma Pharma Algeria made strategic decisions. Additionally, the inventory of NOPAIN is sufficient to meet the current demand. In order to meet the expected demand for UNISIA in the second month, the company has formulated a production plan with the goal of manufacturing 100,000 units in month1. The plan adheres to specific parameters:

- Lot size: 100,000
- Lead time requirements: 15 days

The provided information also reveals the company's strategic plan for the third month to avoid stockouts of the same products. Al-Hikma Pharmaceuticals has anticipated the risk of stockouts by forecasting sales and receiving firm orders. The projected sales for UNISIA are 600,000 units with firm orders of 300,000 units, while for NOPAIN, the projected sales are 170,000 units with firm orders of 90,000 units. Consequently, the company has developed a production plan accordingly. This plan aims to produce 900,000 units of UNISIA and 100,000 units of NOPAIN in the second month.

To provide an illustrative analysis, we have chosen Annex 3 as an example, focusing on the fourth month. During this period, Al Hikma Pharma Algeria anticipated potential stock shortages for their three products: UNISIA, NOPAIN, and PROSPAN. Recognizing this risk, the company took proactive measures by initiating the required raw material requests in month3. This proactive approach showcases their dedication to mitigating stock shortages, ensuring a seamless production process, and maintaining optimal inventory levels. Factors such as lead times and lot size were carefully considered for each raw material.

The implementation of Material Requirements Planning (MRP) brings significant advantages in reducing stock shortages. In the case of Hikma Pharma Algeria, MRP enabled them to accurately calculate their material requirements for UNISIA, PROSPAN, and NOPAIN. This calculation

was based on demand forecasts, firm orders, and production schedules. By leveraging MRP, the company was able to proactively plan and procure the necessary raw materials, effectively preventing stock shortages for these specific products in the fourth month. Annexes 4,5,6 provide further details and explanations of these actions.

2. Optimized stock levels:

MRP implementation plays a pivotal role in optimizing inventory management and driving overall company performance for Hikma Pharma Algeria. By considering factors such as supplier lead times and production lead times, MRP helps determine the appropriate stock quantities needed to meet anticipated demand. This enables the company to strike a balance between preventing excessive inventory and ensuring sufficient stock levels to satisfy customer needs.

One of the significant benefits of MRP is the reduction of costs associated with inventory management. By optimizing stock levels, Hikma Pharma Algeria can minimize carrying costs and mitigate the risk of obsolescence. Additionally, the company can enhance customer satisfaction by ensuring the availability of the right products at the right time. Timely order fulfilment contributes to improved customer satisfaction levels and strengthens the company's reputation.

The positive correlation observed between the utilization of MRP and company performance, particularly in terms of customer satisfaction, further substantiates the effectiveness of MRP implementation. Through comprehensive utilization of MRP, Hikma Pharma Algeria can streamline its supply chain, improve inventory management, and enhance product availability. This correlation implies that as the utilization of MRP increases, customer satisfaction also tends to increase, demonstrating the significant impact of MRP on overall company performance.

Moreover, the correlation between the sales growth rate and stock turnover rate sheds light on the connection between efficient inventory management and the company's ability to sell products effectively. A high stock turnover rate indicates strong customer demand and efficient inventory control, leading to quick product sales. On the other hand, a low stock turnover rate may signify

sluggish sales or excess inventory, which can result in higher carrying costs and potential issues with obsolete stock.

By leveraging MRP effectively, Hikma Pharma Algeria can improve its stock turnover rate by aligning production and procurement with actual demand. Accurate demand forecasting and production planning facilitated by MRP help prevent stockouts, minimize excess inventory, and maintain optimal stock levels based on customer requirements. The positive correlation between the stock turnover rate and sales growth rate suggests that efficient inventory management and timely product availability contribute to driving sales and revenue growth.

3. Improved visibility and planning:

MRP provides visibility into short and medium-term material requirements. This enables planners and production managers to make informed decisions regarding resource needs, production capacities, and delivery schedules. The benefit of MRP lies in facilitating planning and decision-making by providing accurate and timely information.

4. Reduced production costs:

By optimizing stock levels, avoiding stockouts, and enabling better planning, MRP contributes to reducing production costs. By avoiding production disruptions, delays, and costs associated with excessive inventory, MRP helps improve overall efficiency and profitability.

5. Shortened lead times:

Through effective management of material requirements and supplier lead times, MRP helps reduce product lead times. This enables the company to meet customer delivery deadlines, enhance customer satisfaction, and strengthen its competitiveness in the market.

6. Optimized production capacities:

MRP assists in optimizing the utilization of production capacities by providing procurement recommendations based on demand forecasts. By avoiding overloads or underutilization of capacities, MRP allows the company to make the most of its resources and optimize productivity.

The implementation of Material Requirements Planning (MRP) has proven to be highly beneficial for Hikma Pharma Algeria. By considering factors such as supplier lead times, production lead times, and demand forecasts, MRP has enabled the company to optimize inventory management and enhance overall performance.

The analysis of the MRP data has shown that by utilizing MRP, Hikma Pharma Algeria has been able to accurately calculate their material requirements and plan production accordingly. This has resulted in reduced stock shortages, minimized excess inventory, and improved customer satisfaction. The correlation between the utilization of MRP and company performance further supports the effectiveness of MRP in driving positive outcomes.

Additionally, MRP has helped Hikma Pharma Algeria streamline its supply chain, improve inventory control, and ensure timely availability of products. This has had a positive impact on sales growth, as efficient inventory management has led to increased stock turnover rates and improved overall revenue.

Overall, the utilization of MRP has brought significant advantages to Hikma Pharma Algeria, including improved inventory management, increased customer satisfaction, and enhanced company performance. It has become a valuable tool in driving operational efficiency and supporting the company's growth objectives.

Conclusion

In summary, this chapter presented a comprehensive analysis of the implementation of Material Requirements Planning (MRP) in Hikma Pharmaceuticals and its impact on business performance. The findings revealed significant enhancements in the management of raw material orders, characterized by reduced delivery lead times and the avoidance of stockouts. This, in turn, resulted in cost reductions and improved production efficiency. Complementing the quantitative analysis, Value Stream Mapping (VSM) played a crucial role in identifying non-productive activities and enhancing overall operational efficiency. The inclusion of qualitative interviews with stakeholders provided valuable insights into their perceptions and the overall effects of the MRP and VSM approach on business performance. The chapter underscored the importance of considering additional factors, such as machine capacity, to attain a comprehensive view of optimizing operational processes. These findings contribute to a deeper understanding of the benefits, challenges, and potential avenues for further improvements in leveraging MRP to enhance business performance.

General conclusion

In conclusion, the primary objective of this master's thesis is to analyze and evaluate the role of Material Requirements Planning (MRP) in enhancing business performance. This research topic holds significant importance due to the potential benefits of MRP in areas such as cost control, process optimization, and customer satisfaction. By examining the impact of MRP on commercial performance, this study contributes to the academic field of supply chain management and provides valuable insights for researchers.

The essay underscores the necessity for companies to adopt robust production strategies and leverage innovative technologies to streamline their operations and achieve continuous improvement. In this context, Material Requirements Planning (MRP) emerges as a highly regarded methodology for effectively managing inventory, production schedules, and supply chain operations. Its implementation offers opportunities for better coordination among supply chain partners, reduced lead times, and enhanced responsiveness to market demands. By exploring the various components of MRP and investigating its influence on business performance, this research sheds light on the potential advantages of implementing MRP systems and provides practical recommendations for optimizing their implementation.

The problem addressed in this study revolves around examining the role of Material Requirements Planning (MRP) in enhancing the commercial performance of Hikma Pharma Algeria. The main question that this research seeks to answer is: How does MRP enable the optimization of upstream logistics operations and improve the commercial performance of Hikma Pharma Algeria?

The numerical results obtained through the practical case study and the theoretical discussions studied have allowed us to identify elements of answers confirming or refuting the research hypotheses.

At the conclusion of this three-chapter study, we have been able to derive the following findings:

a) **The first hypothesis**

“The MRP is software tool allowing optimizing the manufacturing process thanks to a system of production planning and automated inventory, it grants the possibility of studying several relevant factors within the framework of the orders of raw materials such as the deadlines of delivery, product life, stock coverage” has been confirmed in Chapter 03, Section 03

Following the application of Material Requirements Planning (MRP) in the study project at Hikma Pharma and a thorough analysis of the obtained results, it has been conclusively confirmed that the hypothesis holds true. MRP, being a sophisticated software tool, effectively optimizes the manufacturing process by implementing a systematic approach to production planning and automated inventory control. It affords the opportunity to meticulously examine pertinent factors within the realm of raw material orders, encompassing critical aspects such as delivery deadlines, product lifecycle, and stock coverage.

b) **The second hypothesis**

“The use of MRP software in production processes enables the optimization of raw material and component management, as well as production lead times. This can lead to a reduction in production costs and improved production and procurement planning.” Has been confirmed in section 03 of the third chapter through the analysis of MRP and VSM

The analysis of Material Requirements Planning (MRP) and Value Stream Mapping (VSM) has unequivocally shown that the adoption of MRP software enables effective control and optimization of raw materials and components, resulting in the establishment of efficient production workflows and reduction in lead times. Consequently, this leads to cost savings and significantly enhances the comprehensive planning of production and procurement activities.

c) **The third hypothesis**

“The application of MRP software contributes to improving commercial performance by reducing the risk of stock outs, enhancing customer service, and increasing operational efficiency within the company. As a result, the product will be readily available, compliant, and high-performing, which reflects a strong brand image for a competitive business.” has been confirmed in Chapter 03, Section 03 and 04

The analysis of MRP and the calculation of the correlation coefficient provide robust evidence to support the hypothesis that the application of MRP software enhances commercial performance. It achieves this by reducing stock out risks, enhancing customer service, increasing operational efficiency, and ultimately ensuring the availability of compliant and high-performing products that contribute to a strong brand image for the company.

The research findings suggest that while implementing MRP software can offer benefits, it is not sufficient on its own to drive significant improvements in business performance. Factors such as production capacity, adjustments in schedules, and inventory management need to be considered alongside MRP for enhanced performance. This study contributes to a better understanding of MRP complexities and emphasizes the importance of considering multiple factors for comprehensive business improvement. The insights provide valuable guidance for pharmaceutical companies seeking operational optimization in a competitive market. Additionally, factors like organizational experience and stability play a crucial role in achieving sustainable and impactful improvements in business performance.

It is highly recommended to organize educational courses for company workers on MRP and its utilization this promotes improved communication, collaboration, and optimal use of MRP, leading to enhanced operational efficiency and overall business performance.

It is highly recommended to automate all supply chain departments, particularly inventory management, by implementing Warehouse Management System (WMS) in conjunction with MRP to control and optimize the supply chain processes.

In summary, this study faced limitations such as limited access to data and literature, as well as time constraints. Addressing these limitations in future studies will contribute to a deeper understanding of the subject and its implications.

There are two recommendations that we consider can serve as a starting point for future studies and research related to the analysis of the role of MRP in improving business performance:

- **Integration with Advanced Technologies:** Explore the integration of MRP with emerging technologies such as artificial intelligence, machine learning, and predictive analytics. Analyze how these advanced technologies can enhance the effectiveness and efficiency of MRP systems, leading to improved business performance.
- **Supply Chain Collaboration:** Examine the impact of collaborative supply chain practices on the effectiveness of MRP systems. Study the integration of MRP with supplier relationship management, demand planning, and inventory management to understand how collaboration can drive business performance improvements.

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Appendices

Annexe 01: Interview Guide

Section 01: Introduction of the interviewer and the company

1. Can you please introduce your company and your role within it?

Section 02: MRP Implementation and Benefits

2. Can you briefly explain the current process of managing raw material orders and production in your company?
3. Why did you choose to use MRP in your company? What were the objectives?
4. What were the main challenges you faced during the implementation of MRP?
5. What are the key benefits you have observed as a result of implementing MRP in your company?
6. How has MRP contributed to improving the efficiency and speed of your raw material order management process?
7. How has MRP contributed to improving production planning in your company and reducing production costs?
8. How has the implementation of MRP helped minimize stockouts and optimize stock levels for your company?
9. How has the implementation of MRP improved the competitiveness of your company in the market?
10. Can you introduce the following products: UNISIA, PROSPANE, NOPAINE?
11. How has MRP improved the efficiency of upstream logistics operations for UNISIA, PROSPANE, NOPAINE?
12. How does your company use MRP data to forecast demand and plan production for each of the three products?

Section 03: Comparison with Other Planning Tools

13. How does MRP compare to other production planning tools such as Kanban or Just-In-Time (JIT)?

Section 04: Future Developments and Conclusion

14. How would you overall assess the impact of implementing MRP on your company's business performance?
15. What future developments are planned to further optimize the use of MRP software and improve your company's performance?

Annexe 2:

	STOCK	LOT SIZE	Safety Stock(Stock de sécurité)	Lead Time(Delais d'obtention)	Average forecast(Prévision moyenne)	EMH(Excédent moyen de consommation)	Available forecast 0(OP)
UNISIA	1 000 000,00	100 000,00	401 666,67	1,00	398 333,33	401 666,67	598 333,33
PROSPAN	1 250 000,00	22 500,00	183 333,00	1,00	316 666,67	183 333,33	1 066 667,00
NOPAIN	1 300 000,00	100 000,00	424 167,00	1,00	287 500,00	412 500,00	875 833,00

MONTH 2					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DF)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
400 000,00	96 000,00	42 333,33	100 000,00	4 000,00	900 000,00
200 000,00	-	761 667,00	-	-	-
300 000,00	150 000,00	240 833,00	-	-	100 000,00

MONTH 3					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DF)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
600 000,00	300 000,00	42 333,33	900 000,00	600 000,00	900 000,00
300 000,00	150 000,00	311 667,00	-	-	157 500,00
170 000,00	90 000,00	80 833,00	100 000,00	10 000,00	800 000,00

Annexe 3:

	STOCK	LOT SIZE	Safety Stock(Stock de sécurité)	Lead Time(Delais d'obtention)	Average forecast(Prévision moyenne)	EMH(Excédent moyen de consommation)	Available forecast 0(DP)
UNISIA	1 000 000,00	100 000,00	401 666,67	1,00	398 333,33	401 666,67	598 333,33
PROSPAN	1 250 000,00	22 500,00	183 333,00	1,00	316 666,67	183 333,33	1 066 667,00
NOPAIN	1 300 000,00	100 000,00	424 167,00	1,00	287 500,00	412 500,00	875 833,00

MONTH 3					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DP)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
600 000,00	300 000,00	42 333,33	900 000,00	600 000,00	900 000,00
300 000,00	150 000,00	311 667,00	–	–	157 500,00
170 000,00	90 000,00	80 833,00	100 000,00	10 000,00	800 000,00

MONTH 4					
Projected sales(PV)	Firm Order(CF)	Forecast Available END(DP)	PMPE(PDPf)	Available for sales(DAV)	PMPS(PDPd)
800 000,00	100 000,00	42 333,33	900 000,00	800 000,00	100 000,00
400 000,00	50 000,00	19 167,00	157 500,00	107 500,00	472 500,00
700 000,00	120 000,00	60 833,00	800 000,00	680 000,00	300 000,00

Annexe 4:

	MATERIAL CODE	MATERIAL DESCRIPTION	Stock	Lot	delivrey
UNISIA	2VIB4020G	VIGNETTE BLANK 40*20MM GREEN	1 000 000,00	100 000,00	1Month
	20LBL1210	OUTER LABEL BLANK 120*100 MM	10 000,00	500,00	1Month
	2ALFP200	ALUM 25 oPA,45 AL,60 PVC Form Pack 199MM	10 000,00	700,00	1Month
	2CB602222	Caisse fond automatique 600x220x220 MM	45 000,00	900,00	1Month
	2BXUNSF8530F	UNISIA 8/5mg BOX B/30 FULL PROCESS	800 000,00	150 000,00	1Month
	2INUNSF	UNISIA INSERTS FULL PROCESS	250 000,00	50 000,00	1Month
	2ALUNS8532	UNISIA 8/5mg ALU FOIL (30µm) 199MM	10 000,00	200,00	1Month
	9UNST85	UNISIA 8/5MG TAB	10 000 000,00	1 000 000,00	1Month
	9UNS85I	UNISIA 8/5mg FINAL BLEND	20 000,00	200,00	1Month
	1MGSTRV	MG. STEARATE VEG. GRADE PH. EUR/NF	250,00	50,00	1Month
	3UNST85PR-ALGPRV	UNISIA 8MG/5MG TAB. PREMIX	2 000,00	400,00	1Month
	Month 3				
	Bb	OL	SPf	OPf	OPd
	900000,00		100000,00	1000000,00	
	5760,00		840,00	3000,00	
	5625,00		225,00	2100,00	700,00
	5760,00		32840,00		
	900000,00		100000,00	900000,00	
	900000,00		50000,00	900000,00	50000,00
	3150,00		3350,00		
	27000000,00		0,00	26000000,00	3000000,00
	5490,00		8410,00		
	180,00		20,00	150,00	
	4500,00		100,00	4400,00	400,00

Annexe 5:

	MATERIAL CODE	MATERIAL DESCRIPTION	Stock	Lot	delivrey
PROSPAIN	2BXPRNS1FP	PROSPAN INSERT FULL PROCESS	450 000,00	30 000,00	1Month
	2LAPRNF	PROSPAN SYRUP 100ml BOX FULL PROCESS	300 000,00	10 000,00	1Month
	2VIB4020W	PROSPAN LABEL FULL PROCESS	3 500 000,00	50 000,00	1Month
	9PRNS100	VIGNETTE BLANK 40*20MM WHITE	400 000,00	45 000,00	1Month
	2CAPFPR	White Cap 28mm (ASTRA)	500 000,00	30 000,00	1Month
	2BTWOM123	125ML W/O MARK BOTTLE	900 000,00	55 000,00	1Month
	2CUPDOS	DOSING CUPS	500 000,00	20 000,00	1Month
	9PRNSI	PROSPAN SYRUP PREPARATION	9 000,00	4 000,00	1Month
	1YVLEXT	IVY EXTRACT	30,00	10,00	1Month
	1CTRCACA	CITRIC ACID ANHYDROUS	9,00	5,00	1Month
	1SRBCRST	SORBITOL CRISTALISE	3 000,00	1 000,00	1Month
	1FVCHERRY	CHERRY FLAVOUR	100,00	15,00	1Month

Month 3				
Bb	OL	SPf	OPf	OPd
157500,00		292500,00		180000,00
157500,00		142500,00		330000,00
157500,00		3342500,00		
157500,00		242500,00		275000,00
157500,00		342500,00		135000,00
157500,00		742500,00		
157500,00		342500,00		140000,00
18900,00		-5900,00	4000,00	64000,00
158,00		2,00	130,00	500,00
32,00		2,00	25,00	100,00
16065,00		935,00	14000,00	50000,00
158,00		2,00	60,00	480,00

Annexe 6:

	MATERIAL CODE	MATERIAL DESCRIPTION	Stock	Lot	delivrey
NOPAIN	2VIB4020G	VIGNETTE BLANK 40*20MM GREEN	240 000,00	100 000,00	1Month
	2OLBL1210	OUTER LABEL BLANK 120*100 MM	2 000,00	500,00	1Month
	2CB602222	Caisse fond automatique 600x220x220 MM	1 900,00	300,00	1Month
	2PVCDCN1	PVC+PVDC NEUTRAL 199 MM(250/40)	2 000,00	700,00	1Month
	2BXNPF20FND	NOPAIN FCT X 20 FCT BOX PROCESS New D	260 000,00	100 000,00	1Month
	2ALNPF1	NOPAIN TAB. AL/FOIL 199MM	300,00	150,00	1Month
	9NOPF275	NOPAIN 275 MG FCT	4 200 000,00	500 000,00	1Month
	1EUDNE3	POLYACRYLATE DISP. 30% (EP)	40,00	15,00	1Month
	9NPF27CR	NOPAIN (NAPROXEN SODIUM 275 mg) CORES	4 500 000,00	500 000,00	1Month
	3NOPFNXSCFB-ALG	NOPAIN (NAPROXENE SODIQUE) FINAL BLEND	8 000,00	2 000,00	1Month
Month 3					
	Bb	OL	SPf	OPf	OPd
	800000,00		40000,00	700000,00	300000,00
	6672,00		494,00	6000,00	2500,00
	6672,00		94,00	5700,00	2700,00
	4280,00		685,00	3500,00	1400,00
	800000,00		60000,00	700000,00	300000,00
	712,00		99,00	600,00	300,00
	15999640,00		200405,00	14000000,00	6000000,00
	120,00		10,00	105,00	45,00
	15999640,00		405,00	13500000,00	6000000,00
	12000,00		500,00	6000,00	6000,00

Table of contents:

DEDICATION	
ACKNOWLEDGEMENTS	
ABSTRACT	
LIST OF DIAGRAMS	
LIST OF FIGURES.....	
LIST OF TABLES	
LIST OF ABBREVIATIONS	
CONTENTS	
GENERAL INTRODUCTION	1
CHAPTER I : Overview of Commercial Performance	
Section 1: Literature Review on Commercial Performance.....	7
A. EVOLUTION OF RESEARCH ON COMMERCIAL PERFORMANCE.....	7
<i>A.1. Early Research On Commercial Performance.....</i>	<i>7</i>
<i>A.2. The Explosion of Research on Business Performance.....</i>	<i>8</i>
<i>A.3. The Main Approaches to Research On Business Performance.....</i>	<i>9</i>
<i>A.4. Recent research on business performance.....</i>	<i>10</i>
B. CONCEPTUAL MODELS OF BUSINESS PERFORMANCE: A LITERATURE REVIEW	10
C. Methodological Approaches to Assess Business Performance.	13
Section 2: Conceptual analysis of business performance.....	14
A. The Theoretical Foundations of Business Performance	14
A.1. Definition of performance	14
A.1.1 Efficiency	14
A.1.2 Effectiveness.....	15
A.1.3 Relevance	16
A.2. Typologies of Performance	17
A.2.1 Commercial performance	17
A.2.2 Internal and External Performance	17
A.2.3 Organizational performance:	18
A.2.4 Operational performance:	19
A.2.5 Managerial performance:	19
A.2.6 Economic performance:.....	19
A.2.7 Strategic performance:.....	19
A.2.8 Social performance:	19

A.3. Performance indicators	20
A.3.1 Different types of performance indicators	20
A.3.2 Performance factors	21
A.4. The main axes of commercial performance	22
A.4.1 The commercial function	22
A.4.2 Definition of commercial performance	22
A.4.2.1 Goal setting	24
A.4.3 Determinants of commercial performance	25
A.4.4 The levers of commercial performance	26
A.4.4.1 Knowing and understanding the market	26
A.4.4.2 Differentiating from the competition	26
A.4.4.3 Evaluating commercial activity	26
A.4.4.4 Identifying growth opportunities	27
A.4.4.5 Directing commercial action	27
A.4.4.6 Setting individual contribution	27
A.4.4.7 Strengthening the influence of salespeople	27
A.4.4.9 Building team dynamics	28
A.4.5 The indicators of commercial performance:	28
A.4.5.1 Definition of indicators of commercial performance	28
A.4.5.2 Types of commercial performance indicators	29
A.4.5.2.a Quantitative indicators	29
A.4.5.2.b Qualitative Indicators	32
A.4.5.2.c Key Performance Indicators based on rates	34
A.4.6 Tools for measuring commercial performance	35
Section 3: The main Elements and characteristics of business performance.....	37
A. Tools for monitoring business performance	36
B. Techniques for measuring business performance	37
C. Strategies and tactics to improve commercial performance	39
D. Obstacles and challenges of commercial performance	40
Section 4 : Commercial Performance in the Pharmaceutical Industry	43
A. the Specificity of Commercial Performance in the Pharmaceutical Industry	41
B. Challenges and Opportunities for Commercial Performance in the Pharmaceutical Industry	42
B.1. Challenges	42
B.2. Opportunitie	43
C. Key success factors for commercial performance in the pharmaceutical industry	44
Chapter II : Order Processing Planning and production Optimization	48
Section 1 The planning of the processing of raw material orders within the company:	48
A. Basic concepts of Raw Material planning:	49
A.1. Definition of planning	49
A.2. Objectives of planning	50

A.3.	<i>The importance of planning in production</i>	50
A.4.	<i>Definition of raw materials</i>	51
A.5.	<i>The classification of raw materials</i>	51
A.6.	<i>Sources of Raw Materials</i>	52
A.7.	<i>Importance of Raw Materials</i>	52
A.8.	<i>Definition of Raw Material Planning</i>	52
B.	<i>Production planning:</i>	52
C.	<i>Raw Material Planning Process</i>	53
C.1.	<i>The importance of Raw Material Planning process</i>	54
D.	<i>Raw Material Inventory</i>	55
D.1.	<i>Monitoring raw material inventory levels</i>	55
D.2.	<i>Raw Materials Inventory Categories</i>	56
E.	<i>Raw Materials Requisition</i>	56

Section 2: Optimization of production, a true key success factor.....57

A.	<i>General</i>	58
B.	<i>The principles of production optimization:</i>	58
B.1.	<i>Value Chain</i>	58
B.2.	<i>Decomposition of the value chain</i>	59
B.3.	<i>The Theory of Constraints</i>	59
B.4.	<i>The Five Focusing Steps of Theory of Constraints</i>	60
B.5.	<i>Lean Methods</i>	61
B.6.	<i>The core principles of Lean Methods</i>	61
C.	<i>Production optimization tools and techniques</i>	63
C.1.	<i>Six Sigma</i>	63
C.2.	<i>Value Stream Mapping (VSM)</i>	64
C.3.	<i>Value Stream Mapping Methodology</i>	65
C.4.	<i>Just-In-Time</i>	66
C.5.	<i>Just-In-Time Methodology</i>	66
D.	<i>The impact of Optimizing Production</i>	67

Section 3: The main tools for order planning and production optimization.....68

A.	<i>Material Requirements Planning (MRP)</i>	68
B.	<i>Material Requirement Planning II (MRP II)</i>	69
B.1.	<i>The categories of company needs according to MRP:</i>	70
B.2.	<i>The main MRP information system files</i>	70
C.	<i>Supply Chain Management</i>	71
C.1.	<i>Supply Management Stages</i>	71
D.	<i>Enterprise resources planning (ERP)</i>	72
D.1.	<i>Characteristics Enterprise Resources Planning (ERP)</i>	73

<i>E. The importance of the tools of order planning</i>	74
<i>F. The impact of the tools of order planning on the production optimization</i>	75

Section 4: The impact of order and production management on a company's sales performance.....76

<i>A. The importance of efficient order and production management for meeting customer demand: ..</i>	76
<i>B. Minimizing lead times and improving customer satisfaction through effective order and production management</i>	77
<i>C. Reducing production errors and defects to maintain brand reputation and increase customer loyalty</i>	78
<i>D. Effective inventory management to reduce storage costs and minimize the risk of stock outs</i>	78
<i>E. Enhancing production efficiency through streamlined order and production management to drive sales growth</i>	79
<i>F. Benefits of an efficient order and production management</i>	79
<i>G. Challenges of efficient order and production management</i>	80

CHAPTER III : THE ROLE OF MRP IN IMPROVING BUSINESS PERFORMANCE IN HIKMA PHARMACEUTICAL COMPANY82

Section 1: Presentation of the company and the hosting structure (Hikma Pharmaceuticals).....83

<i>A. Hikma Worldwide:</i>	83
<i>B. Hikma in Algeria:</i>	84
<i>B.1. Historical Overview:</i>	84
<i>B.1.1 Production Sites</i>	85
<i>B.1.2 Group's Strategic Vision:</i>	85
<i>C. Distribution Network of HPA</i>	86
<i>D. The departments of Hikma Pharma Algeria (HPA)</i>	86
<i>D.1. Organizational Chart Analysis:</i>	87
<i>D.1.1 Human Resources Department:</i>	87
<i>D.1.2 Financial Management Department:</i>	88
<i>D.1.3 Legal Affairs Department</i>	89
<i>D.1.4 Research and Development Department:</i>	90
<i>D.1.5 Medical Affairs Department:</i>	90
<i>D.1.6 Sales and Marketing Department:</i>	90
<i>D.1.7 IT (Information Technology) Department:</i>	91
<i>D.1.8 Supply Chain Management Department:</i>	91
<i>D.1.8.1 Presentation of the welcoming department:</i>	91
<i>D.1.8.2 The company's positioning in relation to its environment</i>	92
<i>D.1.8.2.a The company facing competition</i>	92

<i>D.1.8.2.b The rank of the company</i>	94
<i>D.1.8.2.c The evolution of the company's turnover/revenue</i>	95

Section 2: Presentation of the research methodology of the study97

<i>A. The qualitative study</i>	97
<i>A.1 Presentation of the Interview guide</i>	97
<i>A.2 Interview profiles</i>	99
<i>A.3 The interview guide</i>	100
<i>A.4 General Analysis</i>	110
<i>B.The quantitative study:</i>	112
<i>B.1 Application of MRP</i>	112
<i>B.2 The industrial and commercial plan:</i>	113
<i>B.2.1 The production master plan:</i>	115
<i>B.2.2 The components of an industrial and commercial plan</i>	116
<i>B.3 Calculation of Net Requirements</i>	118
<i>B.3.1 Net requirement table components</i>	119
<i>B.4 Scheduling of work:</i>	120
<i>C. Value Stream Mapping</i>	121

Section 3: Presentation of the study results.....125

<i>A. Application of MRP to the project under study</i>	125
<i>A.1 Calculation of the Industrial and Commercial Plan (ICP)</i>	126
<i>A.2 The nomenclature of products</i>	126
<i>A.3 The Master Production Schedule (MPS)</i>	130
<i>A.4 Net Material Requirements (NMR)</i>	134
<i>A.4.1 Gross material requirements</i>	134
<i>A.4.2 Net Requirements Calculation:</i>	136
<i>B. The Value Stream Mapping</i>	145
<i>B.1 Steps for creating a VSM for the current state and future state (target):</i>	146
<i>B.1.1 Analysis of Current VSM Maps:</i>	149
<i>B.1.2 Definition of the action plan</i>	151
<i>B.1.3 Implementation</i>	152
<i>C. Correlation Analysis</i>	153
<i>C.1 Correlation Calculation</i>	153
<i>C.1.1 Correlation between Customer Satisfaction on a scale of 1-10 and Product Availability Rate</i>	153
<i>C.1.2 Correlation between on-time delivery rate and stock turnover rate</i>	156
<i>C.1.3 Correlation between Prospan /Nopain /Unisia turnover and MRP utilization rate</i>	158
<i>C.1.4 Correlation between sales growth rate and inventory turnover rate</i>	162

<i>Section 4: Synthesis and analysis of the study results</i>	164
<i>MRP contribution analysis</i>	165
General Conclusion	170
Bibliography	174
Appendices	